RESEARCH NUMBER

19 Apr '55
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Journal

of the association for physical and mental rehabilitation

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SEPTEMBER—OCTOBER, 1955

VOL. 9, No. 5

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The Journal of the Association for Physical and Mental Rehabilitation
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Volume 9 Number 5

Published Bimonthly
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Tel. BRyant 9-9642

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THE JOURNAL OF THE ASSOCIATION FOR PHYSICAL AND MENTAL REHABILITATION

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STRENGTH FROM MORPURGO TO MULLER– A HALF CENTURY OF RESEARCH*

ARTHUR H. STEINHAUS, Ph.D.**

Introduction

The fact that persistent use of muscles causes their enlargement and a correlated increase in their strength has been known ever since there were boys and finally found its way into Greek mythology. But only the most careful researchers of the past 57 years have revealed the nature and limitations of this increase, the kind of exercise that brings it about, and the laws that governs its development.

Ignoring for the moment the very important individuals who theorized in anticipation and verified in retrospect, the names of three experimenters mark the road that brought us to our present knowledge of the anatomy and physiology of strength. These are Morpurgo, Siebert, and Muller. Their work has yielded findings and conclusions that are essential to an understanding of strength and its development.

The Anatomic Nature and Limits of Strength Increase

In 1897, Professor B. Morpurgo of the Pathological Institute of the University of Siena wrote as follows:

> As certain as is the fact that the mass of voluntary muscle increases in response to greater work so uncertain is our knowledge concerning the mechanism that underlies this enlargement. There is no lack of assertions in the literature that deal with this subject in more or less decisive fashion and interpret the activity-hypertrophy as either a true hypertrophy in the sense of Virchow or as a combination of hyperplasia and hypertrophy; but exhaustive proof is everywhere lacking.

Then Morpurgo reports his own brilliant studies to establish the following facts:

Two months of running in which one dog ran a total of 3218 km and another 1550 km in exercise wheels, resulted in 53% and 55% increases respectively, in the cross section of sartorius muscles taken out after exercise compared with those taken out before the exercise period.

This increase in size was attained with no increase in the number of muscle fibers. The average cross section area of 249 fibers from the muscle taken out before compared with that of 252 taken out after exercise in the case of the second dog, was 1 : 1.54. Thus the exercise increase in cross section was fully accounted for by increases in the cross section of individual fibers.

The average diameter of 770 fiber fragments ½ to 1 cm. long teased sartorius taken before exercise was 22.1†. The corresponding average of 803 fibers from the sartorius taken after 2 months of training was 31.4. Thus the average diameters vary as 1 : 1.42. These findings were checked by more rigid observations in which maximal diameter measurements were made on fiber fragments 2-3 cm long. The average diameter of 306 such fibers from the muscle taken out before exercise was 31.25 and 323 from the hypertrophied muscle, 43.75. The ratio in this case was 1 : 1.40. The larger average diameter is probably more accurate since examination of longer fiber fragments avoided inclusion of as many tapering end portions of fibers. The ratio of 1 : 1.40 is very similar to the 1 : 1.42 observed in the much larger sample.

From his published curve the frequency distribution by fiber diameters of the longer fiber fragments from control and hypertrophied muscle it is evident that (1) the thinnest fibers after exercise are as thick as the average of the control, (2) the hypertrophy distribution is moved to the right and is much higher and narrower than the control, (3) very few fiber diameters after exercise exceed the largest diameters of the control but more attain this size.

From a comparison of these findings with those of others who observed pathological hypertrophies, Morpurgo postulates that exercise hypertrophy is characterized by narrowing of the range of fiber diameters whereas in pathological hypertrophy the difference between the smallest and the largest fiber increases.

To determine if exercise caused any change in fiber lengths, Morpurgo measured the length of a total of 1800 fibers from 9 different muscles in a rat that had run 2,830 km in two months and as many fibers from its resting control litter mate. The former averaged 11.0 mm and the latter 11.1 mm. Because this difference of .1 mm was consistent in most fibers he thinks it is a real difference. Certainly there is no evidence that exercise causes a lengthening of the fiber.

To determine whether changes in the myofibrilla or in the sacroplasm are responsible for the exercise hypertrophy, he photograhed and enlarged

*Read before The Connecticut Valley Conference, 1954.

**Professor of Physiology, George Williams College, Chicago, Ill.

†Diameters in microns—Ed.

[1]MORPURGO, B., Ueber Activitats — Hypertrophie der willkurlicken Muskeln, *Virchows Archiv* 150, 522-544 (1897)

cross sections of the sartorius of dog No. 1 to 900 diameter. In 10 sq. cm of these enlargements he counted 1900 fibrilli in the normal muscles and only 1250 in the hypertrophied muscle. This gives a ratio of 1.52 : 1 that is the inverse of the cross section ratio which for the same dog was 1 : 1.53 and indicates that there was no increase in the number of fibrilli. He next teased myofibrils apart and measured their diameters. The fibrils from both the exercised and control muscle regularly measured 0.00042 mm in diameter. He concludes that the hypertrophy is due to an increase in the sarcoplasm.

Since the muscle fiber is a syncytium it is important to know whether this hypertrophy is accompanied by a multiplication of the cells that are fused to form the fibers. To answer this question Morpurgo examined many longitudinal sections for the occurence of dividing nuclei but found none. He then counted the nuclei in fragments of 20 fibers from each, the exercised and control muscles, and calculated the number of nuclei per 1/10 cu mm of muscle substance. For the control muscle this figure was 7671 and for the hypertrophied one it was 5084. The ratio of 1.5 : 1 is again the inverse of the cross section and indicates that exercise produces no increase in the number of nuclei. He contrasts with this the established finding of increase in nuclei in pathologic hypertrophy.

In an attempt to determine if the muscle spindle whose function was then still unknown, in any way participated in the hypertrophy changes, Morpurgo made the following useful observations. Each sartorius whether from an exercised or a control rat contained a total of eight spindles. These were always located in predictable positions in corresponding muscles. There was also no difference in either the number or the size of their contained intrafusal fibers attributable to the exercise program.

Overload for Strength

According to Petow and Siebert[2] of the famous clinic of Wilhem His, Lange who was a student of Roux, expressed the Roux-Lange views on hypertrophy most concisely in a small book which Roux himself published after his pupil's death.[3] In this book Lange says:

> Only when a muscle performs with greatest power, i.e., through the overcoming of a greater resistance in a unit of time then before would its functional cross section need to increase****. If, however, the muscle performance is increased merely by working against the same resistance as before for a longer time, no increase in its contractile substance is necessary****. Hypertrophy is seen only in muscles that must perform a great amount of work in a unit of time. The athlete who in a few seconds generates great power in lifting a weight, in a fast run, or in a jump, possesses massive musculature. Distance runners, walkers, or swimmers lack the same.

Petow and Siebert[4] restate these Roux-Lange generalizations more precisely as follows: *Hypertrophy results from an increase in the intensity of work done (increase of work in a unit time) whereas the total amount of work done is without significence.* They then report two studies which provide the first experimental evidence for this overload theory. Seven rates in group A, after appropriate training, were forced to run 20 minutes per day at a rate of 26 meters per minute for six months — a total of 96.72 km.

Seven paired litter mates in group B had to run 320 minutes per day at 6.5 meters per minute for six months — a total of 324.48 km.

Seven paired litter mates in group C were held as unexercised controls.

Their findings are reported in a concise table of relative weights (Table 1.)

In the second study[5] Siebert caused all rats in three groups to run at 9 meters per hour but for varying lengths of time. (Table 2.)

Siebert stimulated the gastrocnemius muscles of seven frogs in the following manner. In each instance the leg on one side was tied firmly to the frog board to prevent any leg movement. The opposite leg was permitted free movement. When now both legs were stimulated with identical strengths of tetanizing currents alternating 3 seconds of stimulus with 3 seconds of rest for a total of 20 minutes on 14 successive days, the muscles from the tied legs

---

[2]PETOW, H. and W. SIEBERT, Studien uber Arbeitshypertrophy des Muskels, *Z. klin. Med.* 102, 427-433 (1925)

[3]LANGE, *Uber Funktionelle Anpassung USW,* Berlin, Julius Springer (1917)

[4]PETOW, H. and SIEBERT, W., *Op. Cit.*

[5]SIEBERT, W., Untersuchungen uber Hypertrophie des Skellet-muskels, —. *klin. Med.* 109, 350-359 (1928)

	Group A 26 m/min.	Group B 6.5 m/min.	Group C Control
Heart	1.15	1.04	1.00
Gastrocnemius	1.13	1.03	1.00
Quadriceps	1.05	.99	1.00

Table 1.

Group	Amount of Running	Body Weight	Grms per Kilo Body Weight	
			Heart	Gastrocnemius
A	3 mo, 1 hr per day (57.6 km)	221	3.57	6.10
B	3 mo, 3 hrs per day (172.8 km)	226	3.57	6.26
C	6 mo, 3 hrs per day (345.6 km)	230	3.57	6.20

Table 2.

that contracted isometrically weighed on the average 13% heavier than those from the untied side.

Thus Petow and Siebert were able to demonstrate experimentally that skeletal muscles hypertrophied in proportion to the intensity of the work demanded by them. They also showed that the greater the intensity the greater the hypertrophy. Stated in another way, only when the intensity is increased (overload) does hypertrophy follow.

Training for Strength

For more than a decade Erich A. Muller of the Max Plank Institut fur Arbeitsphysiology experimented in Dortmund, Germany, to discover the fastest way to increase muscle strength and the essential factors necessary to produce hypertrophy. Success came when toward the end of this period he began to work with one of his students, Th. Hettinger, on static contractions in which intensity and duration were easily measured. Seventy-one separate experiments were performed on nine male subjects over a period of 18 months.[6] All training was done in the form of pulling and holding a predetermined amount of tension against a spring scale, most of the observations were made in the flexors and extensors of the forearm held horizontally at right angles to the upper arm. On Saturday maximal strength was measured. The higher reading of two trials was recorded. Sunday was a day of rest. Mondays thru Fridays were devoted to training sessions in which the intensity of contractions, the length of time held, and the number of practices per day were varied. A number of significant findings emerged.

1. Muscle strength increases an average of 5% per week when the training load is as little as 1/3, or even less, of maximal strength.
2. Muscle strength increases more rapidly with increasing intensity of training load up to about 2/3 of maximal strength. Beyond this, increase in training load has no further effect.
3. One practice period per day in which the tension was held for six seconds resulted in as much increase in strength as longer periods (up to full exhaustion in 45 seconds) and more frequent practices (up to 7 per day).
4. The cause of the increase in strength (training stimulus) is belived to be neither the intensity of contraction nor the degree of exhaustion of a muscle fiber, but rather a condition in which the oxygen supply to a muscle fiber ceases to be enough for its needs. A further oxygen deficit is not a stronger or more effective stimulus. Thus, they postulate an 'all or none" characteristic of the training stimulus to hypertrophy. The observation that strength grows more rapidly as the training load increases from about 1/3 to 2/3 maximal strength is only an apparent contradiction. They believe that due to the internal arrangement of fibers within a muscle not all fibers are equally taxed so that until the load is about 2/3 maximum are all fibers suffering some oxygen deficit. Note: In 1939 Barcroft and Miller[7] reported that the flow of blood through the gastrocnemius was cut off when tension on the tendon of Achilles exceeds 100 kg. This they calculated to be about 0.2 of the maximal pull estimated from the calf size.
5. From measurements of biceps diameters in maximal contraction they calculate a maximal contraction strength of 6.6 kg/cm^2 (about 95 pounds per square inch) of muscle cross section. They found that cross sections calculated from muscle diameters closely paralleled cross sections calculated from total strength, using this factor (6.6 kg/cm^2). Thus, they further conclude that the effective training stimulus extends from somewhere below 2 kg. to somewhere under 4 kg. per square cm. of cross section.
6. They found a correlation of +.77 +/−0.09 between (a) maximal increase in strength due to training and (b) the speed of this improvement, when 20 different muscle groups were compared. Finger muscles increased a maximum 33% and showed an increase of 3.2% per week. For hip flexors the corresponding figures were (a) 177% and (b) 22.1%.

[6]HETTINGER, TH. and E. A. MULLER, Muskelleistung und Muskel-training, *Arbeitsphysiologie* 15, 111-126 (1953)

[7]BARCROFT, H. and J. L. E. MILLER, Bloodflow Through Muscle During Sustained Contraction, *J. Physiol.* 97, 17-31 (1930)

7. With tension per square cm. of cross section held constant, endurance (holding time) is unchanged with increase in total strength. This indicates an improvement in capillarization paralleling hypertrohy.
8. The rate of increase in strength sometimes varied considerably in the same person when two comparable training periods, separated by a long rest period, were compared.
9. There is a ceiling on the development of strength in every muscle. Attainment of this maximum is usually accompanied by pain resulting from some injury within the muscle that stops further increase in effort.
10. Maximal strength of any muscle in the body is probably about 3 times the tension demanded of it in everyday activities.

Maintenance and Persistence of Strength

In more recent work that Professor Muller communicated to the writer by letter dated June 6, 1954, he and Dr. Hettinger investigated how much exercise is necessary to maintain strength once it has been developed. Their latest findings are summarized as follows:

1. Under the training regime already described the average increase in muscle strength is about 5% per week. If training is discontinued after a few weeks, strength recedes at a loss of about 5% per week back to the original value.
2. A muscle trained to be, let us say, 50% stronger than originally may thereafter be maintained indefinitely at this level by two, probably only one, maximal contraction effort per week. They have not yet determined the minimal amount of training necessary to hold strength.
3. When a muscle that has been trained to 50% greater strength was maintained at this level for 12 weeks by one maximal contraction per week and then given no further training nor testing the results were astonishing. In the first 12 weeks of no special activity, strength was almost completely retained at the high level and in the next following 28 weeks in Prof. Muller's own words, "strength was still far from having returned to the level it started from at the beginning of the experiment."

Summary

From these history making experiments the following conclusions essential to the understanding of strength, its development, and its maintenance may be summarized.

First, the extent of hypertrophy of a muscle is determined by two limiting factors as follows: (a) the number of muscle fibers is fixed by heredity and conditions of embryonic development and cannot be changed by exercise, (b) small muscle fibers hypertrophy under exercise but only up to a fixed limit. (The present author believes that this limit is determined by diffusion rates, i.e., the time it takes for essential substances to pass from the capillaries that lie outside the fibers to the center of the fiber. A fiber that is too thick to be effectively serviced cannot persist).

Second, no matter how much a muscle is used, it will not grow larger or stronger until it is overloaded. This means that the intensity of the work required of it must be increased above that to which it is currently accustomed, i.e., it must be required to exert more power (foot pounds per minute) or work against greater resistance, than before.

Third, the stimulus to hypertrophy appears to be associated with, if not itself, a state of oxygen deficit within the muscle fiber. Contracting a muscle to develop a tension of from somewhat less than 1/3 to 2/3 of its maximal strength for a period of only six seconds, once a day, sufficiently cuts off the circulation to cause an oxygen deficit in all of its contained fibers and therefore induce the maximum speed of hypertrophy.

Fourth, rapid training induces only a loosely "anchored" adjustment of the muscle to the increased demands made on it. If, however, this increased strength is maintained for a time it becomes fixated or anchored in the muscle. To what extent increasingly longer periods devoted to fixing the results of training called by them, "Trainingsfestigungs-Zeiten," might lead to correspondingly firmer anchoring of strength for periods of years or even life, is worthy of investigation.

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CORRECTIVE THERAPY AND THE HOME PROGRAM IN THE TREATMENT OF MULTIPLE SCLEROSIS*

STANLEY H. WERTZ**

Introduction

It was not so many years ago that the authors of most medical textbooks considered multiple sclerosis a hopeless, incurable and steadily progressive disease with its victims possessing a life expectancy of not more than three to fifteen years. However, recent studies and surveys tend to give a much brighter outlook to the whole clinical picture. The survey conducted by MacLean and Berkson[1] at the Mayo Clinic has unearthed some very surprising facts concerning mortality and disability in this disease.

A group of specially selected patients was followed over a ten-year period from 1940-1950. These cases had been previously diagnosed at the Clinic from 1934-1939 and each was typified by a history of at least one exacerbation and subsequent remission. At the time of the definitive visit when the diagnosis was clearly established, the average age of each patient was 34.6 years and the duration of the disease 7.0 years. Of 406 cases which could be followed at the end of the ten-year period, 79 per cent were still living. This survival rate is about 85 per cent of normal as calculated by the actuarial method[2] covering a period of ten years following the definitive visit to the clinic. Of 278 patients who were able to work and walk at the time of the initial visit, 42 per cent were still able to perform in this manner and 88 per cent of this group were still living. Those surviving represent 94 per cent of a normal group of similar age, and those still able to work and walk constitute 45 per cent of the number who would be normally alive and well at the end of ten years. Considering the fact that the average patient had the disease several years before this study was initiated, these facts are all the more enlightening in view of previous concepts of mortality and disability. Furthermore, it would seem to indicate that there exists a great number of mild cases which take a benign course and are seldom seen in the hospital or rehabilitation center.

Schumacher[3], in his evaluation of drug therapy, refers to the course of the disease as "chronic, steadily progressive and remittent." As he infers, the disease is not steadily progressive in all cases. In many instances patients have had remissions which lasted five years or longer. Cailliet[4], in his study of 201 patients followed over a period extending from July 1946 to February 1950, found that seventy-six (38 per cent) were progressive in the sense that they developed new neurological signs and symptoms. Sixty-five (32.5 per cent) were considered stationary over a period of five years or longer, and fifty-nine (29.5 per cent) were considered insidious in that their disability was increased in a subjective or objective manner over periods of five years or longer. These recent surveys, each based on an adequate number of patients, tend to brighten considerably the outlook for this disease.

Whereas previous studies have been undertaken to determine the course of the disease, the prognosis as to mortality or disability and the benefit, if any, derived from drug therapy, this particular survey has been undertaken to ascertain the value of the home exercise program over a five-year period following the initial treatment stay at the hospital.

Since February 15, 1950, thirty-five patients with a clinical diagnosis of multiple sclerosis have undergone treatment in the corrective therapy section of the Physical Medicine and Rehabilitation Service at the Veterans Administration Medical Teaching Group Hospital, Memphis, Tennessee. A research project was started and accurate statistical information, based on clinical observation, has been obtained during the past five years of the course of the disease, type and degree of the disability, and the improvement or regression of each patient.

Upon the termination of the initial hospital stay each patient was discharged with a home program of exercise to preserve the gains made while under treatment at the hospital and to retard, insofar as possible, the further progression of the disease, particularly the disability that is caused by the atrophy

*Presented at the Ninth Clinical and Scientific Conference, Association for Physical and Mental Rehabilitation, Boston, Mass., July 1, 1955.

**Certified Corrective Therapist, Veterans Administration. Medical Teaching Group Hospital, Memphis, Tenn.

[1]MacLEAN, A. R. and BERKSON, J., Mortality and Disability in Multiple Sclerosis; A Statistical Estimate of Prognosis. *J.A.M.A.*, 146:1367-1372, August 11, 1951.

[2]BERKSON, J. and GAGE, R. P., Calculation of Survival Rates for Cancer. *Proc. Staff Meet., Mayo Clin.*, 25:270-286, May 24, 1950.

[3]SCHUMACHER, G. A., Multiple Sclerosis; An Evaluation of Drug Therapy. *J.A.M.A.*, 143:1052-1055, July 22, 1950.

[4]CAILLIET, R., The Rehabilitation Treatment of Multiple Sclerosis and Its Rationale. *Occupational Therapy and Rehabilitation*, 29:1-10, February 1950.

of disuse. In some cases it was necessary to have a relative of the patient visit the hospital during the last week to learn to assist the patient in his home therapy. It was planned to recall each patient for a check-up at intervals of six months during the first year following discharge. However, because of the distance of travel and the expense involved, only seventeen patients living in or nearby Memphis were able to return to the hospital for follow-up purposes. The average check-up period required twelve days, and during this brief stay the patient's condition and disability were re-evaluated and the home program altered to meet the individual situation.

Case Analysis

The group of thirty-five patients treated for multiple sclerosis consisted of thirty-three men and two women. Four of the men were Negroes. The following facts were ascertained and are fairly consistent with other recent studies:

1. The age of onset in all cases except one was between the ages 20-40 years, the average being 28.0 years.
2. The duration of illness at the time of the initial hospital visit varied from less than a year to sixteen years, the mean being 5.5 years.
3. The onset in all cases except two was insidious. Two experienced a sudden onset and early disability.
4. The average age of each patient on admission was 33.6 years.
5. The degree of disability of each patient on admission was categorized as follows: (a) five were considered mild, being able to walk varying distances unaided and capable of total self-care; (b) twenty-one were moderately disabled, each able to walk a limited distance with crutches and canes and capable of most self-care skill; (c) nine were considered severely disabled, having no ability to walk at all and being capable of only minor self-care.
6. The course of the disease in twelve cases was marked by exacerbations and incomplete remissions. Twenty-three were considered progressive from the standpoint that their symptoms and disability had increased over a varying number of years with no marked remission.

Problems Complicating Rehabilitation

It is extremely doubtful if any other disease known to medicine brings on a disability so difficult to combat with therapeutic measures and with manifestations so protean. Many types of disabilities were presented making the problems of rehabilitation very complex. The degree of disability of the thirty-five patients ranged from one who had a slight weakness and numbness in one ankle to one of almost complete spastic quadriplegia with incontinence of bowels and bladder and near blindness.

Chronic fatigue was a factor in all cases, and careful dosage of exercise was necessary, graded to the tolerance of each patient. Balance loss was a complicating factor in the retraining of patients in ambulation, being particularly marked in the ataxic cases. Impairment of positive sense and intention tremor were present in many cases, making ambulation and the performance of self-care skills very difficult. Seventeen patients presented a type of paralysis which on first observation appeared unilateral and similar to hemiplegia in disability. On closer examination, however, some weakness was always detected on the other side. Nineteen patients complained of low back pain. In most cases, this was traced to weakening of the abdominal muscles with tightness of the iliopsoas and the hamstrings, bringing on the characteristic lumbar lordosis.

Scanning speech (dysarthria) was noticeable in 70 per cent of the group on admission. All except six had a history of some type of ocular pathology. Diplopia was common and usually appeared early in the disease. Nystagmus and blurred vision were residuals in other cases.

Despite the classical association of euphoria with multiple sclerosis, more patients were observed in this group who exhibited a hysterical type of personality structure[5] with labile emotions. The most common type of emotional disorder observed was an anxiety state. Others showed a lability of emotional response which vacillated between laughter and tears. Eight patients had symptoms of euphoria, but in most instances the disease had taken a benign course. Jonez[6] has stated that a great many patients who appear euphoric exhibit this state as a defensive mechanism to cover up their inner feeling of tension in regard to the general attitude of people toward them and their fear of the future. Furthermore, he found that very few patients out of the large group treated at his clinic were actually euphoric. The pattern of hysterical personality structure with labile emotions in a greater number of patients is indicative that it may be more consistently associated with the disease. The various types of disabilities encountered in this study are enumerated in Table 1.

[5]BLATT, B. and HECHT, I., The Personality Structure of the Multiple Sclerosis Patient as Evaluated by the Rorschach Psychodiagnostic Technique. *J. Clin. Psychol.*, 7:341-344, October 1951.

[6]JONEZ, H. D.: Management of Multiple Sclerosis. *Postgrad. Med.*, 11:415-422, May 1952.

TABLE I

DISABILITIES OF 35 M.S. PATIENTS

TYPE	No.	Percent
Spastic Paraplegia (Inc.)	5	14.3%
Spastic Quadriplegia (Inc.)	10	28.6%
Ataxic Quadriplegia (Inc.)	11	31.4%
Spastic And Ataxic Quadriplegia (Inc.)	9	25.7%
Impairment Of Visual Acuity (Moderate)	21	60.0%
Impairment Of Visual Acuity (Acute)	8	22.8%
Bowel And Bladder Dysfunction (Moderate)	20	57.1%
Bowel And Bladder Dysfunction (Acute)	7	20.0%

Corrective Therapy Techniques

Each patient was referred to the corrective therapy clinic following a consultation with the psysiatrist. On the first visit a complete self-care evaluation was made to determine the full extent of the disability. The importance of this phase of rehabilitation cannot be overemphasized. Gordon[7] in his monograph on rehabilitation technique opines that the results obtained from the neuromuscular examination do not establish any definite criteria whereby one can predict the ability of the patient to perform integrated movement patterns such as those exemplified by the performance of self-care skills. Intensive training must be given and frequent tests conducted in all-important modality of treatment.

All patients were started with thirty minutes of therapy consisting of conditioning exercises for the affected muscle groups. Resistance exercises of the type developed by Kabat[8,9] and his co-workers were employed. The pulley weight exercises[10] were employed in most cases during the initial treatments with the patient in various positions on an exercise table. The treatment period was gradually increased to one hour daily with gait training being added when the patient was ready. Heavy resistance techniques were employed with patients having mild disability and little or no incoordination. However, where greater disability was present with gross incoordination, medium resistance was employed with emphasis on control and coordination. Heavy resistance to the point of fatigue does not work well with patients who have such chronic neurological symptoms as tremor, ataxia, rebound and spasm. In fact, these conditions can be made worse. In many cases it has produced an accumulation of fatigue which is carried over from one day to the next until a state of physical exhaustion exists.

Some patients elected to take therapeutic swimming for an additional half hour each day. Since the water temperature was maintained at 88 degrees, this activity proved very beneficial for the spastic type of individual. The warm water had a very relaxing effect and the patient was often able to perform movements in this environment which he could not duplicate in the therapeutic gymnasium.

Results of Corrective Therapy

Of the thirty-five patients treated for multiple sclerosis, twenty-seven made practical improvement during their initial hospital stay. In three cases there was no change, and five continued to grow worse in spite of the treatment. The condition of four patients was so advanced that they were actually beyond help at the time, and five whose disability was such that they might have been helped were obviously in an acute stage of the disease. One patient who improved from wheelchair to ambulatory status was in an obvious state of remission. Of twenty-eight patients who complained of bowel and bladder disorders, nineteen reported some measure of improvement concomitant with their overall increase in strength and endurance.

Each patient was hospitalized for an average of forty-nine days and received an average of thirty-nine treatments. The results of rehabilitation therapy during the hospitalization of the thirty-five patients are listed in Table 2.

TABLE II

IMPROVEMENT AND DISPOSITION

STATUS ON DISCHARGE	No.	Percent
From Ambulatory To Better Ambulatory	15	42.9%
From Wheelchair To Ambulatory	12	34.3%
Improved Performance Of Self-Care Skills	21	60.0%
Remained Wheelchair Patients	8	22.8%
Discharged With Home Program	35	100.0%
To Domiciliary Or Other Hospital	0	0.0%

In January 1955 a follow-up survey was initiated on the group of patients that had been treated at VAMTG Hospital during the previous five years. A questionnaire was formulated which, when filled out for each patient, would accurately describe the present in terms of general physical condition, ambulatory

[7]GORDON, E. E., *Multiple Sclerosis; Application of Rehabilitation Techniques.* National Multiple Sclerosis Society, 1951, p. 12.

[8]KABAT, H.: Studies on Neuromuscular Dysfunction; XII. A New and More Effective Technique for Treatment of Paralysis through a Cerebellar Mechanism. *Permanente Found, M. Bull.,* 8:9-19, January 1950.

[9]KABAT, H.: Studies on Neuromuscular Dysfunction; XIII. New Concepts and Techniques of Neuromuscular Re-education for Paralysis. *Permanente Found. M. Bull.,* 8:121-143, July 1950.

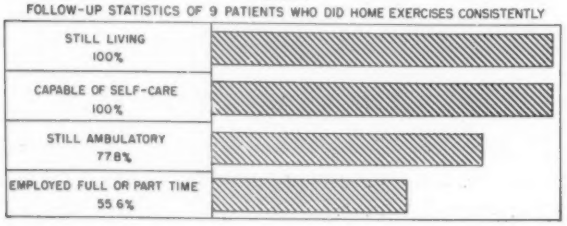
[10]WERTZ, S. H., Basic Exercises in the Treatment of Multiple Sclerosis and Similar Diseases of Neuromuscular Dysfunction. *Journal of the Association for Physical and Mental Rehabilitation,* 4:16-17, January 1951.

status, self-care ability, and record of employment since discharge from the hospital.

On February 28, 1955, thirty follow-ups had been completed. The remaining five patients had moved and could not be traced. Of the group which could be followed, five patients living in or near Memphis were seen in personal interviews. Three came to the hospital for check-ups during this period, and twenty-two were contacted by personal letter and accompanying questionnaire. In the case of one of the latter group a private investigator was used to obtain the required information.

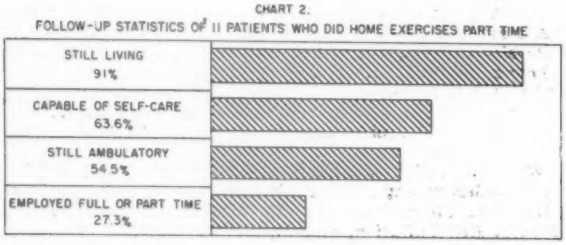
In Chart 1 are the statistics on nine patients who followed their home programs consistently from the time of their discharge from the hospital. The degree of disablement at the time of the initial visit was as follows: two lightly disabled, six moderately disabled, and one severely disabled. The average duration of the disease for this group was 8.8 years and the interval since discharge 2.6 years. All except two were still able to walk, and five were gainfully employed in such positions as an attorney, a salesman, a clerk-typist, a magazine feature writer, and a janitor.

CHART 1
FOLLOW-UP STATISTICS OF 9 PATIENTS WHO DID HOME EXERCISES CONSISTENTLY



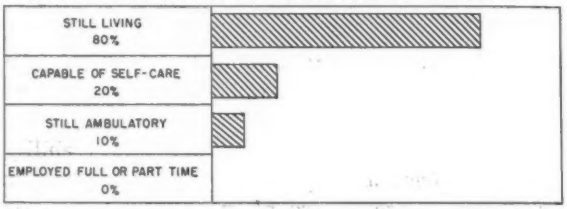
Eleven reported that they did their home exercises part-time but not consistently. The initial degree of disablement for this group was as follows: one slightly disabled, seven moderately disabled, and three severely disabled. The average duration of the disease was 7.4 years and the interval since discharge 2.0 years. Six of this group were still able to walk, and three were employed part-time; one as a farmer and another as an insurance salesman. One man operated a suit club using his home as headquarters. One severely disabled patient died in February 1955 after having been bedfast for two years (see Chart 2).

CHART 2.
FOLLOW-UP STATISTICS OF 11 PATIENTS WHO DID HOME EXERCISES PART TIME



Ten patients did not cooperate in their home therapy and reported that they did no exercises at all. For these patients the duration of the disease was 8.0 years and the interval since discharge 2.0 years. Of six who were able to walk at the time of their discharge from the hospital, only one was still ambulatory. None was employed and only two were capable of performing their self-care activities. Two died during the year 1954, one from bronchial pneumonia and the other from cerebral arteriosclerosis (see Chart 3).

CHART 3.
FOLLOW-UP STATISTICS OF 10 PATIENTS WHO DID NO HOME EXERCISES AT ALL



Of the thirty patients who had been followed only three had died. Ninety per cent of the group were still living after an average duration of 8.1 years of the disease. As can be readily seen from the charts the greatest variations were in self-care, ability to walk, and employability. These statistics give support to the belief that multiple sclerosis is not the killer or crippler that it has been depicted in the past. The patient who remains active and combats the atrophy of disuse can live a fairly normal and useful life in most instances.

Of the ten patients who did not cooperate in their home therapy, most reported that they "just got discouraged and grew tired of doing them." Several of them stated that they missed the guidance they had received at the hospital and the association with other patients in group therapy.

CASE 1

D. S., age 33, white, married male. The Patient was admitted to VAMTG Hospital on July 11, 1950, and had his first consultation with the Chief of PMR on July 14. He reported ocular disturbances consisting of diplopia and blurred vision dating back to the year 1942 while serving in the regular Army. The first symptoms disappeared as mysteriously as they had come, and he finished his enlistment and was discharged from the Army in December 1945. In 1948, he had the second attack with weakness apparent in the upper and lower extremities, loss of balance and an ataxic gait. He was admitted to a V.A. hospital near his home where a diagnosis of multiple sclerosis was established by a consultant in neurology. Again the symptoms abated, and he was discharged after three weeks and given service-connected status.

In June 1950, he again noticed a recurrence of his symptoms. This time they were more severe. There was a tremor in the outstretched hands and a horizontal nystagmus while looking to the right. Weakness and incoordination again appeared in his upper and lower extremities and he found himself holding on to walls and furniture while trying to walk.

He came to the corrective therapy clinic as a wheelchair

patient on July 15. An examination disclosed that he could walk short distances with an ataxic gait and that he fatigued moderately on exercise. He had no difficulty on the self-care test except on those activities requiring extensive ambulation and the fine coordination of the hands and fingers.

He was started on a program of therapeutic exercise, swimming and gait training. Control and correct pattern of movement were emphasized during the initial stages of treatment. The patient worked diligently and made rapid progress. On August 10, he was able to walk to and from the clinic using two canes. This was a distance of one-quarter of a mile each way. He was discharged as an ambulatory patient with a home program on September 5, 1950.

The first follow-up was made by letter in March 1951. The patient reported that he had moved to a large northern city and had obtained employment as a clerk-typist at an automobile plant. He had terminated an unhappy marriage before leaving home and was living with relatives. He stated that he was doing his exercises every day and was getting along well.

The second follow-up was made in January 1955. He wrote a personal letter and filled out the questionnaire. He was still able to walk and was working every day. He had suffered a slight setback in January 1952, had remissed satisfactorily and stated that his condition had remained unchanged since that time. He reported that his eyesight was good, his speech unimpaired and that he had no difficulty at all with his bowels and bladder. He said that he still kept up his home program. In 1953, he had remarried and this time it had turned out happily for him.

Discussion. This case tends to illustrate the chronic remittent type of the disease which after a period of ten years has become stationary. If the patient had succumbed to one of these crippling attacks and done nothing, he would undoubtedly be a chronic invalid today, more from the atrophy of disuse than from the crippling nature of the disease itself. Moreover, the patient has stated on numerous occasions that all of his previous attacks were preceded by emotional disturbances. He has now learned to avoid emotional upsets as much as possible since he believes they have been a precipitating factor in all of his setbacks.

CASE 2

S. G., white, single male, age 23. The patient came to VAMTG Hospital as an out-patient and had his first consultation with the Chief of PMR on April 12, 1954. He reported to the corrective therapy clinic as an ambulatory patient on April 13. He stated that he had noticed weakness in his ankles beginning in 1953 and that he seemed to fatigue sooner than he should after prolonged walking. He had no disability at all in terms of self-care and very little in walking. However, since he earned his living as a salesman, he was worried about his ability to keep going.

He was given a program of therapeutic exercise with weighted boots and dumbbells. Because of his slight disability heavy resistance was employed with emphasis placed on strength and endurance. He came to the clinic for one hour each morning and took his exercises. The remainder of the day he carried on his job as a salesman. He responded well to treatment and in six weeks had doubled the amount of resistance he was able to overcome on each of his exercises. He also reported that he did not tire as quickly while walking. On July 28 he terminated his treatment as an out-patient and was transferred in his job to a large northern city.

In January 1955 a follow-up was made by personal letter and questionnaire. He replied that he was getting along very well and working every day on his sales job. He was still doing his home exercises daily and was taking one treatment a week at a private clinic. He could still walk a half-mile without resting and had no difficulty with any of his self-care skills. Occasionally, he had a "bad day," but he took it in stride and kept going.

Discussion. This patient was fortunate in having early diagnosis and treatment. Since the onset of the disease in his case was insidious, a greater disability might have resulted by this time. This patient had superior intelligence and was well oriented in the aspects of his disease. This is an all-important factor in the rehabilitation of the multiple sclerosis patient. If he can be motivated to help himself and to follow a prescribed program of activity after he leaves the hospital, he may well be one of those fortunate ones who can lead a normal life with some limitations.

SUMMARY

1. A group of thirty-five multiple sclerosis patients has been studied, thirty of whom have been followed over a five-year period in this report.

2. Out of this group twenty-seven patients (77.2 per cent) made practical and objective improvements during their initial hospital stay.

3. Of thirty patients who could be followed at the end of the five-year period, twenty-seven (90 per cent) were still living. Eighteen (60 per cent) were capable of most of their self-care activities. Fourteen (46.6 per cent) were still ambulatory, and eight (26.6 per cent) were employed full or part-time.

4. Nine patients performed their home programs consistently following their discharge from the hospital. Eleven did their exercises part of the time, and ten did not perform them at all. Charts 1, 2, and 3 show a trend and indicate the effectiveness of prescribed home therapy in offsetting mortality and disability.

5. Two case studies have been presented. One illustrates the value of the home program in coping with the chronic remittent type of the disease. The second shows how early diagnosis and treatment can be effective in offsetting disability in the early stages of the disease.

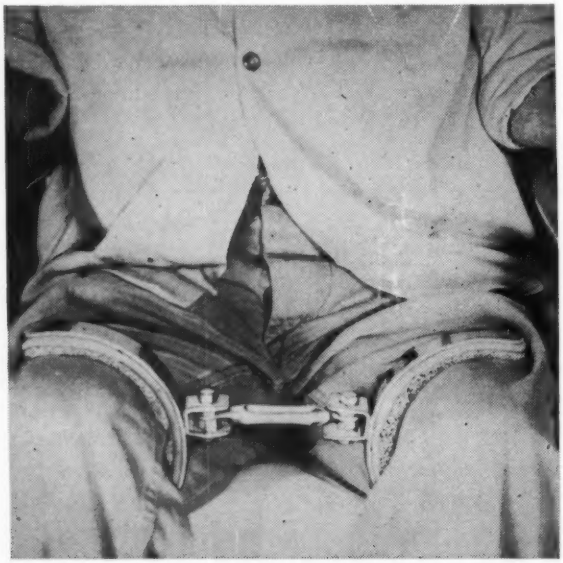
6. There is no evidence to support the belief that exercise therapy can have any effect on the primary disease process, but it has proved its value in combatting secondary complications. It also provides a good psychological stimulus.

7. In conclusion, it appears that the most effective approach to the rehabilitation of the multiple sclerosis patient lies in the application of therapeutic exercises, training in the activities of daily living, and adherence to the prescribed home program.

ADJUSTABLE THIGH SPREADER FOR PATIENTS WITH ADDUCTOR SPASM

CHARLES W. McHUGH*

Adductor spasm of the lower extremities has created several problems in the rehabilitation of paraplegia cases resulting from spinal cord injuries. The need for a device to separate and hold the knees apart led to the development of the adjustable thigh spreader. Although it was designed initially for use by paraplegia and quadriplegia patients, it is equally efficient for any type case where marked adductor spasm is present.



The thigh spreader is constructed from two (2) pieces of ST-24 aluminum 11" x 1-9/16" x 1/8" curved to form a 180° arc. These pieces are padded with leather covered felt, and sponge rubber 1/4" thick is cemented to the leather for additional protection. A length of channel aluminum is riveted to the back of each arc and drilled so that a turnbuckle may be attached to connect the parts.

Previously a tightly rolled bath towel was used to separate the patient's knees but was not entirely satisfactory because it could not be securely retained in the proper position. The new device is easily adjusted to meet the individual need of the patient in addition to remaining in the desired position.

Simple construction, low cost, easy adjustment and fool-proof application are the significant features associated with this device.

Construction requires two (2) to three (3) hours labor and less than $2.00 worth of materials. It is easily adjusted by twisting the turnbuckle to the desired position. The device is shaped to fit the contour of the leg thereby overcoming the tendency of the legs to slip from the device.

The spreader has been used for the following purposes:

1. To help relax spasticity.
2. To prevent formation of ulcers on the medial surface of the knees.
3. As a mechanical aid in cases of adductor spasm where corrective surgery is contraindicated.
4. To simplify the giving of enemas.

The advantages of its use coupled with low cost, simplicity of construction and reliability result in a valuable adjunct to the rehabilitation of those patients who suffer from adductor spasm.

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PHYSIOLOGY OF EXERCISE FOR CARDIAC PATIENTS*

ROSCOE C. BROWN JR., Ph.D.**

The topic, *Physiology of Exercise for Cardiac Patients,* involves the exploration of many interesting principles and facts regarding physiology of exercise in general and the physiology of the circulatory and respiratory systems in particular. When body function during exercise is considered, the paramount importance of the roles played by circulatory and respiratory mechanisms is easily seen. In relating physiology of exercise to cardiac patients we must look at the dynamics of the circulatory and respiratory mechanisms during exercise and also investigate how these dynamics are modified or changed in the cardiac patient.

The circulatory dynamics of exercise involve the heart itself, the peripheral and systemic circulation, and the various neural adjustments related thereto. The heart organ is involved during exercise in providing an increase in cardiac output. This increase can be accomplished by increased heart rate, increased stroke volume, or both. Exercise also affects the coronary circulation, a very important factor in some types of cardiac disease. The success of the circulatory process lies in the ability of the network of arteries, veins and capillaries to carry the blood to the tissues and return it to the heart. During exercise, changes occur in systemic and peripheral circulation. These changes include increases in blood pressure (specifically systolic pressure) and changes in the vasoconstriction and vasodilation mechanisms. The circulatory dynamics of the heart and the peripheral circulation during exercise are closely allied to the neural mechanisms controlling heart and vasomotor action. These neural mechanisms appear to be autonomic in nature and are influenced by changes in the homeostatic balances brought about by exercise. A good example of this is the effect of anoxia or anoxemia of any part of the body on circulatory dynamics.

The circulatory system is closely related to the respiratory system in terms of exercise physiology. Oxygen demand and oxygen availability are closely related to cardiac function. This is a particular problem during exercise for patients with certain types of cardiac insufficiencies. It is known, however, that the relationship between the circulatory system and the respiratory system is influenced by the level of physical fitness or condition of the individual. The more physically fit individual in normal health, tends to work more efficiently. This is most often shown in a fast rate of recuperation, low oxygen debt for work of mild intensity, and a small pulse rate increase during moderate work. The person with a small cardiac output during exercise will adjust to exercise by both a more rapid respiratory rate and a more rapid pulse rate. This is quite often the situation of the patient with cardiac disease.

With this background of the role of the circulatory and respiratory systems in the physiology of exercise, let us turn to some of the principles of physical exercise that relate to both the normal individual and to the cardiac patient. Among the most important are the principles of frequency, intensity and duration, of work. The effects of physical work on the organism are influenced by how often, how much, and how long work is pursued. Work should be considered in terms of these principles of load. Recuperation is influenced by the frequency, intensity,

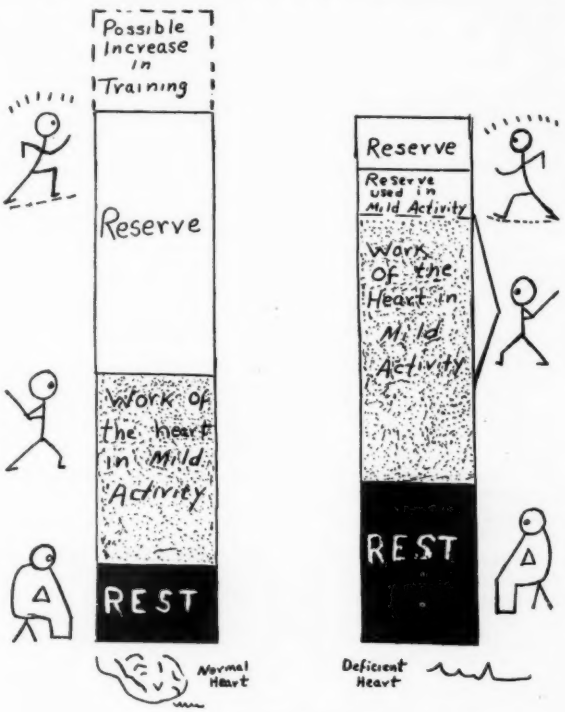


DIAGRAM I

Effect of Cardiac Reserve During Exercise

* Delivered at the Ninth Annual Conference, Association for Physical And Mental Rehabilitation, Boston, Mass., June 29, 1955.

** Assistant Professor of Education, New York University.

and duration of work and is a most important principle related to physical work. Training is another principle of physical exercise that relates to normals and cardiacs. Training primarily helps to increase the efficiency of the circulatory and respiratory mechanisms during and in recovery from work. Training is sometimes helpful in improving the patterns of motor co-ordination which might result in more efficient use of the physiological resources of the body. This latter fact is very important for the cardiac patient. It can be seen*** that the cardiac patient has less of a reserve than the normal person and, therefore, must use every resource to meet the demands of physical exercise.

There are many interesting considerations that arise when the specific topic of physiology of exercise for cardiac patients is examined. One of the more important considerations is the physiological effect of different types of activities on the cardiac patient. For example, static strength activities must be viewed with caution because this type of activity causes greater increase in blood pressure than other types of activities. Endurance type activities and activities involving sudden spurts of exercise should be handled with care where the cardiac patient is concerned. This is particularly important in view of the limited circulatory reserve of the cardiac patient. Sudden changes in posture also might have deleterious effects. Body build, musculature and previous activity experience are additional factors in determining the physiological response of the cardiac patient to exercise. The patient who has had wide sports experience may be well coordinated, but he also may tend to extend himself beyond the safety limits for his particular type of condition.

There are some interesting and fairly accurate ways of determining the physiological limitations of exercise for cardiac patients. One of these techniques involves determining the cardiac's adaptation to a mild type of exercise. Various types of step tests have been developed and reported in the literature for this purpose. Medical supervision and direction is, of course, very important in conducting this type of test for cardiac patients. Another valuable tool is that of studying the "energy cost" of various activities. Energy cost is a physiological measure that enables us to determine how much oxygen is required to perform a work task both during the activity and in recovery from the work. This measurement has great potential in working with cardiac patients in particular. From energy cost studies we can learn what activities the cardiac patient can perform in terms of his physiological limitations. It is also possible from energy cost studies to study the diernal and periodic variations that occur in cardiac patients as a result of physical work.

There are many other important problems relative to physiology of exercise for the cardiac patient that have not been discussed here. Many of these are not too clear to physiologists or physicians themselves. One can see, however, that the physiologists have given us much to work with in developing exercise programs for cardiac patients.

***Diagram I

ASSOCIATION REPRESENTED AT SPRINGFIELD WORKSHOP

The workshop in "New Developments in Adapted Physical Education" held at Springfield College, Springfield, Mass. from July 5 through July 15, 1955 was a very interesting, educational and profitable course for all that attended. The workshop was organized by Dr. Cecil Morgan, Director, Graduate Division, Springfield College and is known to all corrective therapists as the national consultant in corrective therapy.

Besides the workshop there were formal lectures with demonstrations and discussions. Many staff members of Springfield College participated as lecturers or consultants to the workshop groups as well as others known to the Association for Physical and Mental Rehabilitation including Dr. John E. Davis, Dr. Fritz Friedland, Dr. A. B. C. Knudson, Dr. Hans Kraus, Dr. Josephine Rathbone, and Dr. Wesley Woll.

The group taking this course included a medical doctor, physical therapists, recreation directors, physical educators in school systems, and corrective therapists. Among the group were the following members of the Association;

Howard Barnes	Long Beach, Cal.
John Delmar	Perry Point, Md.
Alfred Ellison	Boston, Mass.
Perry Gilbert	Albany, N. Y.
Louis Guignard	Canandaigua, N. Y.
George Heos	Bedford, Mass.
Herbert Johnson	Oakland, Cal.
Lawrence McNulty	Northampton, Mass.
Sidney Mackler	Brockton, Mass.
Emmett Mariano	Lebanon, Pa.
Victor Mayer	Coatesville, Pa.
Robert Parrish	Biloxi, Miss.
A. Lewis Scholl	N. Little Rock, Ark.
Wayne Sidinger	Chillicothe, Ohio
Bernard Weber	Los Angeles, Cal.

Many participants stated that they felt such a seminar and workshop should be offered annually.

A STUDY OF CROSS TRANSFER OF MUSCULAR STRENGTH AND ENDURANCE RESULTING FROM PROGRESSIVE RESISTIVE EXERCISE FOLLOWING INJURY*

KARL K. KLEIN**

Introduction

One of the most recent studies demonstrating the phenomenon of cross transference of strength and endurance brings forth some of the factors in the reconditioning process that have not heretofore been reported extensively as major issues in the literature.[1] Statements such as "he also concluded that *resistance to fatigue* and the size of the muscle increased in the unexercised parts" and "the authors conclude that systematic training of muscles in one limb augmented the strength and *staying power* of the same muscles in the unexercised limb" indicate some interest in the problem of endurance. Although the basic issue of this present study dealt with the problem of reconditioning following knee injury and post-operative recovery, the plan to study the cross transference of these two factors, resistance to fatigue and staying power, was considered as a research project well in advance of the programming of the first subject.

The basic intent of the problem to study the cross transference of endurance qualities of the contralateral muscle groups has been an issue of major concern to the author in a continued effort to place the injured subject back on the job or the athletic field in a state of bilateral balance qualities of strength as well as endurance, because both such qualities are believed necessary for maximal functional use of the contralateral body parts. Further theorizing in this matter would deal with the problem of bilateral muscular strength and endurance to reduce the potential of injury as well as recurrent injury. Elaboration of this latter though will not be discussed here as it constitutes an area now under study but not reported.

Although the gathering of experimental evidence is under continuous evaluation, the data in this phase of the study is taken from 17 case studies of men who have completed the reconditioning program to the optimal level of the system used. The same methods of initial muscular evaluation were used as reported by Johnson and Klein[2] in an earlier study for determining the maximum ten repetitions of the Progressive Resistance Exercise program. Coordinated with this was the use of the tensiometer[3] for determining of the contralateral, static strength measures of the supporting musculature of the knee throughout the study. Records of this instrument were used to determine progress toward the development of bilateral muscular strength in the exercise program.

Subjects:

1. The subjects used in gathering this experimental data were all students except for one staff member of the university. 13 were either freshmen or sophomores and one junior, one senior, one graduate student and one professor completed the group.

2. The range of time from post-operative treatment of injury before program participation was from four months to four years and eight months. The average time was approximately 16 months.

3. Of the 17 subjects, only 2 gave evidence of ligament weakness and in this case both the medial collateral and posterior cruciate appeared stretched as a result of manipulation tests previous to exercise.

4. 13 of the injuries were originally obtained in high school athletics, one in college, one in amateur athletics and one in the military service.

5. 11 of the injuries involved the left leg and 6, the right leg. All of the subjects came to the Corrective Physical Education Clinic for special exercise because of physical signs and symptoms producing knee instability due to muscular weakness, slipping etc. 14 came through Student Health Center medical classification and three from a family physician.

Exercise Procedures:

The exercise technique used during the reconditioning program was a modification of the Oxford

*Presented at the Ninth Clinical and Scientific Conference, The Association for Physical and Mental Rehabilitation, Boston, Mass., July 2, 1955.

**Assistant Professor, Department of Physical Education, University of Texas.

[1] SLATER-HAMMEL, A. T., Transfer of Exercise as a Therapeutic Tool, *Journal of the Assoc. for Physical and Mental Rehabilitation*, April-May, 1951.

[2] KLEIN, K. K. and JOHNSON, E., Research: A Method of Determining the Maximum Load for Ten Repetitions, etc., *Journal for the Assoc. for Physical and Mental Rehabilitation*, June, 1953.

[3] CLARKE, H. H., *Cable Tension Strength Tests*, Brown-Murphy Co., Chicopee, Massachusetts, 1953.

[4] ZINOVIEFF, Heavy Resistive Exercise, the Oxford Technique, *The British Medical Journal*, 14:129-132, June 195

technique as discussed and described by Zinovieff.[4] The adaptation of this technique emphasized the building of strength by use of maximum load and few repetitions through load reduction and increased repetitions with rest periods between exercise bouts.

The individual exercise programs ranged in length from five to eight weeks and were based on three prescription periods per week.

Tensiometer Use:

Tensiometer testing was used to determine (1) initial muscular imbalance, (2) to check progress of cross transference of strength increases as well as (3) to determine bilateral strength balance for program termination.

The three tensiometer scores reported in this study are called *Composite Strength,* and reflect the combined total of the three static strength measures taken on a contralateral sides, i. e., quadriceps extension at 115° and 165° and hamstring flexion at 165°. Only two to three complete measurements were taken throughout the exercise period.

Muscular Strength and Cross Transfer Changes:

Table I indicates the muscular strength gains that were recorded at the completion of the individual exercise period. Muscular strength gains are given for both the exercised and unexercised side in terms of Composite Score gains as well as percentage gains for both sides. Although the average difference in muscular strength gains between the first and last exercise period on the unexercised side has been computed and indicates that 60 pounds difference is significant just above the .05 level of confidence, the author readily accepts any difference between 35-40 as being significant above the .01 level of confidence. Such conclusions are drawn from similar relationships demonstrated in another study of a similar nature where approximately 200 cases were used and the standard error was greatly reduced. Results of this study have not been published.

TABLE I

STRENGTH IMPROVEMENT GAINS BETWEEN FIRST AND LAST TEST ADMINISTERED AND RECORDED IN COMPOSITE SCORE STRENGTH IN TENSION POUNDS

		Injured Exercised Leg				Non-Exercised Leg			
Case No.	Wks.	First Test	Last Test	Ex. Gain	% Gain	First Test	Last Test	Ex. Gain	% Gain
1.	5	R367	588	221	60	517	581	64	11
2.	6	R290	471	181	62	328	483	155	47
3.	7	R259	376	117	45	267	334	67	25
4.	8	L210	418	208	99	408	427	19	4
5.	7	L324	488	164	50	428	485	57	13
6.	8	L360	542	182	50	426	541	115	27
7.	6	L396	510	114	29	439	492	53	12
8.	7	L264	441	177	67	396	447	51	13
9.	5	L313	406	93	30	401	419	18	4
10.	7	*L485	568	83	17	*431	563	132	31
11.	4½	L374	516	142	41	441	520	79	18
12.	4½	L304	427	123	31	348	430	82	23
13.	6	R388	513	125	32	498	523	25	5
14.	4	L331	549	118	35	513	557	44	8
15.	4	R392	458	66	16	435	467	32	7
16.	5	R418	553	135	32	518	547	29	5
17.	6	L385	567	182	47	473	577	104	22

*Note—Strong leg exercised because the knee felt weak and insecure. Note cross transfer gains and exercise value to strong side for weak side improvement shown here.

It is important to note the individuality apparently demonstrated in starting levels, strength, and percentage gains made, and so forth during a P.R.E. program where technique and time are held relatively consistent.

Muscular Endurance and Cross Transfer Changes:

Muscular endurance gains are based on results obtained from testing the previously unexercised side after muscular balance was obtained. It is to be noted, from Table I that there is very little difference in the composite strength score of both the exercised and unexercised composite strength scores of all subjects except No. 3. This one exception will be further noted in this phase of the experiment.

At the beginning of the experiment for the exercised leg, the program was determined as previously stated and each week the maximum 10 RM was increased ten pounds with the endurance phase of the program being advanced approximately five pounds per phase of the daily exercise period. Each week the exercise period approximated 120 RM for both quadriceps and hamstring progressive muscular activity.

At the end of the exercise period, as determined by relative muscular balance, the unexercised leg was tested on the last complete exercise sequence accomplished by the contralateral side. In 16 of the 17 cases the strength phase of the test (10RM) was accomplished after the warmup period. The one case as indicated above (No. 3) was unable to complete any of the 10RM of the test. Apparently the over-balance of strength and endurance gains on the exercised side was significantly high enough to prevent the cross transfer test to be taken.

Knee Extension Cross Transfer Test—

In the remainder of this phase of the testing program, 14 of the subjects were able to complete the entire exercise program but appeared to be under stress during the last series of leg extensions. The other two of the subjects were able to complete all of the program except the last series of leg extensions. In both cases, muscular fatigue prevented program completion. Percentagewise, 14 (82.3%) of the subjects completed the entire cross transfer endurance test; 2 (118.8%) of the subjects completed 66.2/3% of the tests and 1 (5.8%) was not successful in completing any of the tests. The last subject's program was revised to bring about muscular balance before moving him into another activity.

Knee Flexion Cross Transfer Test—

Sixteen of the subjects completed this phase of the testing program.

Summary and Conclusions:

The data gained in this research again substantiates the findings of the studies of Hellebrandt[5], Clarke-Shay-Mathews[6], W. W. Davis[7], Slater-Hammel[8], and others regarding the phenomenon of cross transfer (or cross education) of strength of contralateral body parts.

The empasis placed on the cross transfer of endurance qualities of muscular capacity serves a twofold purpose as brought forth in this study; (1) that it is directly associated with the strength studies and shows the relationship potential of restoration as well as the building of bilateral strength and endurance following injury and (2) it shows the value of P.R.E. as a technique for building such qualities.

[5]HELLEBRANDT, FRANCES; HOUTZ. S. J. and PARRISH, A. M., The Influence of Unilateral Exercise on the Contralateral Limb, *Archives of Physical Medicine*, 27:76-85, 1947.

[6]CLARKE, SHAY and MATHEWS, Strength and Endurance Effects of Exhaustive Exercise of the Elbow Flexor Muscles, *Journal of the Assoc. for Physical and Mental Rehabilitation*, November, 1954.

[7]DAVIS, WALTER W., Researches in Cross Education, *Studies Yale Psychological Laboratory*, 6:6-50, 1897.

[8]SLATER-HAMEL, A. T., *op. cit.*

WOJECKI CHAIRS TRAINERS CLINIC

Eddie Wojecki, Chairman of the National Athletic Trainers Association and an active member of the APMR acted as host to the first annual Southwest Athletic Trainers Clinic held at the Rice Institute in Houston, Texas on August 20. The clinic featured lectures by outstanding authorities in the field of athletic injuries including Dr. E T. Smith, orthopedist and president of the South Texas Medical Association; Eddie Dyer, former manager of the St. Louis Cardinals; Emil Mamaliga of Texas A&M and Karl K. Klein of the physical education staff at the Univ. of Texas.

Mr. Wojecki also served on the faculty of the American Association of General Practice's Assembly held in Los Angeles last March where he was a member of a panel on "Handling the Athletic Injury" with Dr. J. M. Harkness and Lynn Waldorf of the University of California.

STATE OF WASHINGTON RECRUITS VOCATIONAL COUNSELORS

The State of Washington has announced examination and recruitment of personnel in the fields of vacational rehabilitation. Specific positions open are the following: Vocational Rehabilitation Counselor (salary $364-432 monthly); Placement Specialist for the Blind (salary $380-451 monthly) and Supervisor of Vocational Rehabilitation (salary $414-492 monthly). All positions require specific training and experience and all applicants will be required to take a written test covering fields of knowledge and ability pertinent to the positions. Out-of-state residents are eligible to file for the examinations.

Application forms and information regarding the positions are available from The State Personnel Board, 1069 Capitol Way, Olympia, Wash. If writing, address communications to the Board at P.O. Box 688 in Olympia.

ESSENTIAL AREAS FOR RESEARCH BY THERAPISTS*

PAUL F. FLEER, B.S., M.Ed.

Physical Medicine and Rehabilitation is one of the most rapidly advancing medical specialties today, for it has been only within the last decade that it has gained recognition as a major medical specialty. Corrective therapy, which is a new name for an early and continuous phase of physical education, has also seen a rejuvenation and considerable growth since its inception in Veterans Administration Hospitals in 1946.

It is logical, then, to ask the question, why has physical medicine, with its several therapeutic entities including corrective therapy, advanced so rapidly? What is the reason for this? Of course, there can be many explanations, but one of the answers to this question is fairly well agreed upon by many of the foremost leaders in the field. They say that the sine qua non of physical medicine's achievement of its proper status as a speciality in *research*. The Baruch Committee on Physical Medicine in January of 1944 also pointed to research as being one of the three chief needs for the advancement of physical medicine. Furthermore, it has been said that "the advancement of any new field of medicine depends on a parallel development of three things, practice, teaching, and research,"[1] and that, in importance, research is by far the greatest. If this be true, then it would seem that if the field of corrective therapy is to continue its growth and development, it must accept the responsibility for an expanding and continuing program of research.

The need for research in our own field of corrective therapy has been recognized from the beginning by the leaders in our field. When our Association was organized in December of 1947, the office of Publications and Research was established, and in 1949 a Chairman was appointed to head a Research Committee. After the Milwaukee meeting in 1952, our officers recommended that the corrective therapy section of each hospital become responsible for the preparation of one major paper a year relating directly or indirectly to their discipline. At the Washington meeting in 1953, Dr. A. Ray Dawson, Chairman of the Research Committee, presented a committee report outlining the organizational structure of a Research Committee to aid and encourage research among our members. This report contained a rather complete breakdown of the various areas for research. Finally, during this past year attempts have been made to stimulate corrective therapists to write scientific papers for publication. As an incentive, cash awards were offered for the five best papers prepared. Again, numerous areas warranting exploration by corrective therapists were listed.

Much good work in the way of research has already been done as is evidenced by the many fine articles based on clinical research which have appeared in this *Journal* and in the official publications of related disciplines. These articles have been of inestimable value in furthering the cause of rehabilitation. However, much research still needs to be done in every facet of our discipline. Dr. C. H. McCloy, writing in the August-September 1950 issue of the Journal of Physical and Mental Rehabilitation,[2] pointed out the need for research most emphatically by suggesting sixty broad studies on a wide range of topics that need to be investigated.

Now, inasmuch as the essential areas for research by therapists have been so often and so thoroughly pointed out, it would seem presumptious on my part to list them all again. Instead, I would like to make my remarks just as practical as possible.

One problem which blocks the way to doing research for many sincerely interested therapists is that of *where* and *how* to go about getting started. The answer to these questions is basic and logical, and I believe that it is the key to a successful program of research by therapists. A perusual of the definition of the word research and its implications will give us this important key.

Webster says that research is "laborious, careful inquiry or examination." Basically, research is a process of reflective thinking which seeks to clear up a state of doubt and uncertainty by using scientific processes. It begins when a need is felt, a problem is defined, and a determination is made to try to resolve the problem.

Therefore, it can be seen that the key to a successful program of research lies in the willingness and the ability of each therapist to define and tackle the problems in his own area. By his own area, I

*Presented at the Ninth Clinical and Scientific Conference, The Association For Physical and Mental Rehabilitation, Boston, Mass., June, 1955.

[1] FRANK H. KRUSEN, *Physical Medicine and Rehabilitation for the Clinician*, P. 4, W. B. Saunders Co., 1951.

[2] MCCLOY, C. H., Needed Research in the Field of Corrective Therapy, *Journal of the Association For Physical and Mental Rehabilitation*, 4:4:3-10, Aug. 1950.

mean that area in which he is now working; for that is probably the area in which he is best qualified, most experienced, and most interested. One does not necessarily have to go looking for a problem, for there are an abundance of problems in all areas of our work. One needs simply to think critically and objectively about his program, to be thoroughly dissatisfied with its inadequacies, and then to do something about it. Use this key to open the door to research in your area.

Now that we have established the essential area for research by the therapist, let us see what effects this research might have. Broadly speaking, through research the therapist utilizes the great store of clinical material available to him to make positive and important contributions to the patient, to the rehabilitation team, to himself, and to his profession. Recognizing the importance of research to all of these areas, I shall nevertheless confine my further remarks to the last area named, that is to the field of corrective therapy. I do this in order to more thoroughly discuss this important area. For we find ourselves today standing on a threshold, and our next step, in fact our whole future, can be vitally effected by our research efforts.

It should be understood that one of the basic functions of research is that of education. For through research we can very effectively aid in meeting the educational challenge confronting corrective therapy. It is not necessary to indicate to this group the significance of the contributions which we as corrective therapists can and do make to the broad field of rehabilitation. We know how great they are because we see the results of our work every day in our clinics. But we have the further responsibility of showing these results to others so that they can see and understand too. And that is education. So, research leads naturally to education, and is, in fact, a part of education. So acknowledging the tremendous need throughout the country today for education of medical and lay groups alike to the purpose, place, and possibilities of corrective therapy in total rehabilitation, let us think about a few ways in which research can aid this educational process.

First of all, rehabilitation is a process of mobilizing the patient's own resources toward a chosen goal. It is activity-centered. And in many instances a large part of this is physical activity. Since we are the exercise specialists on the rehabilitation team, it is incumbent on us to know the answers concerning exercise. We must have at our fingertips accurate, scientific information concerning the physiological and psychological effects of exercise as well as to know the best procedures for carrying out exercise prescriptions. So, it is our responsibility to the rehabilitation team to carry on the research necessary to find the answers concerning exercise.

Secondly, as we develop new programs and new techniques and attempt to reevaluate existing programs, we must establish methods of evaluation with which to measure objectively the results we obtain. These methods are essential if we wish to show the worth of our programs. We must gather together in statistical form, wherever possible, the proof of the results which we are getting. For we can show, through research, that our approach and our techniques are making the unique contributions which we claim for them.

In the next place, research in the field may be of aid to our colleges and universities in pointing out trends which may indicate needed changes in direction and scope of course content. In a recent communication, the director of one of the outstanding courses in adapted physical education asked that the results of a study now being carried on be made available to him. He felt that they would help him judge the need for his own professional courses. This is but one instance, and yet it undoubtedly reflects the feeling of other educators of corrective therapists and adapted physical educators.

In addition, research can also add to the constantly enlarging fund of therapeutic material. This material is of the greatest value for it can provide an important basis for the improvement of current therapeutic practices. If we are to uphold and improve the standards of corrective therapy and to lead in the development of exercise as a therapeutic tool, we must constantly strive in this direction. Furthermore, the results of our studies may be applicable in other fields. It may be that we can aid in improving the practices of one of the other members of the rehabilitation team and thus make for better all-around results. This turning up and sharing of facts among the members of the rehabilitation team tends to produce the harmony so essential for good coordination and cooperation. Our prestige with our colleagues in rehabilitation will be enhanced with the subsequent growth of mutual understanding and respect. The net result of this will be an increase in the quality of the coordinated effort.

In this same vein, research in corrective therapy also aids the educational process by helping to define the functions of our discipline. It assists in establishing the relationship which corrective therapy bears to other disciplines. Research points up our sphere of activity, it aids in explaining the rationale of our profession, and it makes clearer our area of responsibility.

A sixth result of our research is its effect on our *Journal.* One of our best means of communicating our research to others and of furthering the orientation of corrective therapy is by preparing articles for publication in the *Journal.* We who work on the clinical level have an excellent opportunity to supply technical and professional information to our fellow therapists and to the field at large. We are judged to a surprising extent on this quality of our *Journal,* and that quality is dependent in a large measure on our contributions. In this connection, it is important to remember that the ability to add to human knowledge in a given field through investigative effort distinguishes a profession from a vocation or a craft skill.

And now a final reason for carrying on research in your own area as an aid in the over-all educational process to corrective therapy. As I mentioned earlier, we are standing on a threshold. And as we look out over the expanse of possibilities for corrective therapy or adapted physical education, there is much that we cannot see clearly. A small part of what we can see looks familiar, and we recognize areas in which corrective therapy is already well established. We see clearly the government sponsored areas with the physical reconditioners and corrective therapists doing fine work in the neuropsychiatric and general medical and surgical facilities. And we see, perhaps a little less distinctly, schools and colleges in which adapted physical educators are struggling against all sorts of odds to meet the needs in these areas. And there are a few other scattered patches which are discernible. But the large part of this expanse of possibilities is indistinct and obscured for there are many areas which have not as yet been explored or opened to us.

The scope which corrective therapy will eventually embrace has not yet been determined and the chances are that it will not be determined for quite some time. Therefore, we still have an opportunity to effect the final decision; to answer some of the basic questions which are being asked today. We, through our research, can aid in more clearly defining the broad scope of our field.

Why do research? Because it is one of our most effective aids in meeting the educational challenge which confronts corrective therapy today. So begin in your own area to try to solve the problems that are constantly confronting you for this is the key which will open the door to a successful and stimulating program of research. Then, little by little, the many possibilities of corrective therapy for further enhancing the rehabilitation of the handicapped will become apparent.

DR. JOKL DISCUSSES CONDITIONING AT PENN STATE LECTURE

Dr. Ernst Jokl, Director of the Kentucky Rehabilitation Center and famed expert on physical fitness, visited the Pennsylvania State University during the past spring for a series of lectures and discussions. The following remarks from Dr. Jokl's talks appeared in the *Newsletter* of the Penn. State Department of Physical Education and Athletics and have been edited for publication by the author who is a contributing editor to this journal.

1. The normal heart is invulnerable to exercise; it adjusts and becomes more efficient under very vigorous training.

2. Blood pressure variations and heart murmurs are not reasons to forego vigorous sports activity if there is no disease present.

3. One's basic physical make-up is largely a result of favorable environment, and especially, nutrition.

4. Athletic fitness does not make one less susceptible to contagious diseases.

5. Aging, senility and the accompaning cardiovascular decline or disease are postponed many years by continued programs of vigorous exercise. The process of maintaining resources, or even unfolding new resources of physical strength and efficiency after age 40, 50, 60, and 70 is still going on. Vigor and efficiency can be preserved through these advanced ages if regular exercise is continued.

6. More and more very young, as well as middle-aged and old men and women, now compete successfully in various championship contests with athletes in their late teens and early twenties. Success at very high performance levels is spreading downward and upward in age. This development is to be encouraged.

7. Extensive studies by gynecologists indicate that athlete women have less trouble with childbirth and rear more healthy children than do non-athletic women.

8. An M.D.'s opinion in physical education is no better than anyone else's unless he bases his statements on evidence within his own sphere.

9. Women are not affected adversely by vigorous and strenuous exercise nor by jumping and the jar of landing in track activities. That vigorous exercises including jumping are harmful to women is a myth.

10. The athletic woman, other things being equal, is more beautiful and charming, more appealing to the male than the non-athletic woman. The development of the shoulder and chest muscles by vigorous gymnastic exercises improves the female form and figure.

11. The average grade school and high school program in America lacks both variety and adequate vigor of activities. We are missing some of the ABC's of basic physical development for strength, endurance and efficiency. The women's programs have erred even more in this respect than the men's.

12. Boxing is dangerous to the delicate cortical areas of the brain.

13. Total performance tests are the only real measures of ability. Piecemeal measures of bits of performance fail to give the desired information. Performance is unit action (Gestalt), not a composite of elements.

14. Through vigorous physical training, body build tends to be moved toward muscular build, both from fat builds and from skinny builds. With cessation of training after years of athletic training, 85% then move toward the stout build and 15% toward the skinny build.

EMOTION AND REFLEX ACTIVITY

GEORGE W. HOHMANN, Ph.D.*

I. *Introduction*

It has been our clinical observation on the Paraplegia Service at the Long Beach Veterans Administration Hospital that there are increases in the amount of spasticity which patients with spinal cord injuries experience during periods of emotional turmoil, even in cases of anatomically complete lesions. For the purposes of this discussion, spasticity may be defined as *the reflex contractions of muscles innervated by segments of the spinal cord below the level of the lesion.* These contractions appear to be spontaneous, but probably are activated by cutaneous receptors and proprioceptors, and are uncontrolled by modulating influences from higher nervous centers.

The relationship between emotional stress and autonomic changes is well recognized, and there is some evidence in the literature that autonomic changes may affect the degree of spasticity. Kuntz[1] transected the spinal cords of cats and did a unilateral sympathectomy after the disappearance of spinal shock. He found a decrease in spasticity on the sympathectomized side. However, sympathectomies did not yield relief from spasticity in man.[2] According to Livingston's review[3] of the literature, cholinergic substances facilitate nervous transmission and adrenergic substances inhibit it, both at the myoneural junction and at the synapse. Martin and Davis[4] believed that histological and biochemical studies of the myo-neural junction may provide some answers to the problems of spasticity. Wenger[5] and others have emphasized the synergistic action of the autonomic nervous system in which predominant sympathetic activity accompanying stress precedes a period of parasympathetic over-reaction. He felt that this "overcompensation" may account for the appearance under stress of many symptoms related to parasympathetic activity.

II. *The Problem*

The primary problem of this investigation was first, to determine whether quantitative changes in spasticity were associated with the experiencing of stress producing stimuli. If so, a secondary question was whether these changes were related to changes in functions believed to reflect autonomic activity.

III. *Method and Material*

Spasticity was measured electromyographically before and after the administration of a stress producing stimulus, and the mean degree of spasticity during a three minute period immediately following the stimulus and in a period extending from the sixth through eighteenth minute after stimulation were compared to the pre-stimulus degree of spasticity. At three minute intervals during the experimental period measures were made to evaluate activity of the autonomic nervous system.

Four stress-producing stimuli were administered following a *nine minute resting period.* Prior to the beginning of each experimental session, a blood pressure cuff, leads of the Grass apparatus and of a skin potentiometer had been attached to the subject. Bilateral needle electrodes were used for continuous and gracilis muscles. Blood pressure values, skin temperature, skin conductance, pulse and respiration rates were recorded as measures reflecting autonomic activity. Although all of these measures were consistent with the presence of sympathetic discharges following stimulation, the blood pressure values were most clearly related to changes in spasticity and were therefore, used as a representative measure of autonomic changes. Blood pressure was measured at nine, six, and three minutes prior to, and at zero, one and one-half, three, six, nine, twelve, and fifteen minutes after stimulation. Spasticity was scored by accumulating the amplitude times the duration of the EMG bursts over an arbitrary time unit of three minutes. The blood pressure was measured at the beginning of these time periods. Four different stimuli were given to each of the twelve subjects in a counterbalanced order, so that for the total experimental group, each stimulus was administered an equal number of times in the first, second, third, or fourth experimental session. Thus each of the twelve sub-

*From the Paraplegia and Clinical Psychology Section, Veterans Administration Hospital, Long Beach, Calif. and the Psychology Department, University of California at Los Angeles.

[1] KUNTZ, ALBERT, *The Autonomic Nervous System.* Lea and Febiger, Philadelphia, 1953.

[2] FREEMAN, L. W., and HEIMBURGER, R. F. The surgical relief of spasticity in paraplegic patients. II Peripheral nerve section, posterior rhizotomy, and other procedures. *J. Neurosurg.*, 1948, 5, No. 6, 556-561.

[3] LIVINGSTON, R. B., Visceral functions of the nervous system. *Ann. Rev. Physiol.*, 1950.

[4] MARTIN, J., and DAVIS, L. Studies upon spinal cord injuries. III Altered reflex activity. *Surg. Gynec. Obstet.*, 1948, 86, 535-542.

[5] WENGER, M. A., Autonomic functions and parasympathetic over-compensation. *Paper presented before Thirteenth International Congress of Psychology. Stockholm,* 1951.

jects underwent four experimental sessions, making a total of 48 sessions. The four stimuli were:

A – fifteen 90 volt condensor-discharge shocks delivered at random over a one minute period.

B – oxygen deprivation was created by rebreathing of the subjects own air volume for a two minute period.

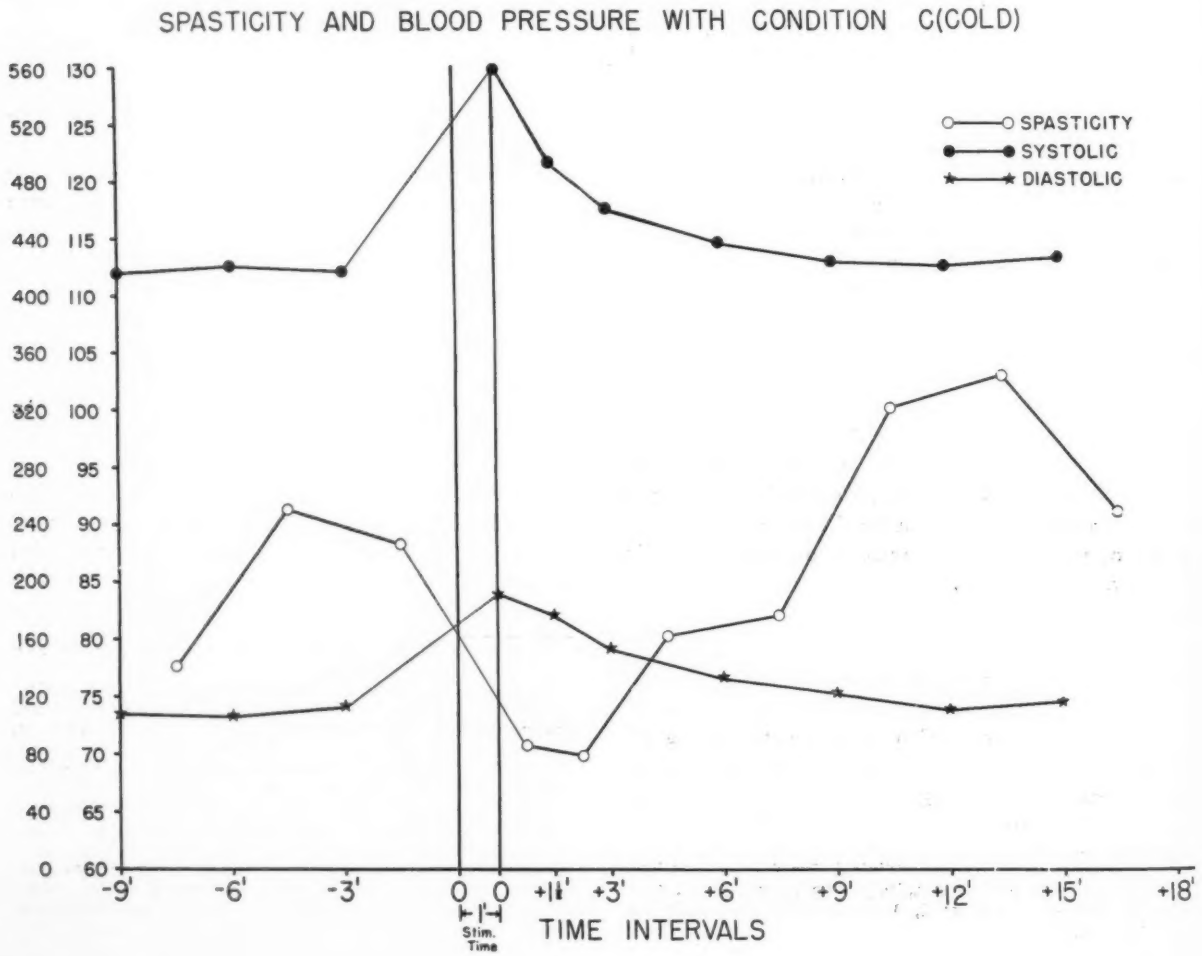
C – pain was elicited by submersion of the left hand in ice water for one minute.

N.– relaxation was suggested by reassurance that no stimulation would be administered during that particular session.

Twelve male paraplegic veterans with known anatomically complete transections of the spinal cord and troublesome spasticity constituted the experimental group. Their lesions were at least eight months old and the level was between the fourth and tenth thoracic vertebrae. At the time of the experimentation they were free from intercurrent illness, had no history of surgical intervention on the autonomic nervous system, and had had no surgical or drug therapy for control of spasticity. Efforts were made to exclude any factors which were known from the patient's past experience, to affect the degree of spasticity. The nature of the experimental procedure was explained in detail prior to the day of the first test.

IV. *Results*

It may be seen in the accompanying figure that definite changes in the amount of spasticity were related to the stressful stimuli. Although the response was more marked following cold stimulation, similar changes followed each of the stimuli. There was a statistically significant decrease in spasticity from the resting level for about three minutes following stimulation. This decrease was accompanied by a statistically significant increase in systolic and diastolic blood pressure over the resting level. There was a statistically significant increase in spasticity over the resting level lasting from the sixth through the eighteenth minute after stimulation. This increase of spasticity was accompanied by a decrease of the systolic and



diastolic blood pressure below the resting level, which, however, was not of statistical significance.

Similar though smaller changes followed the suggested relaxation. There are indications that the subjects were conditioned to expect a noxious stimulus and therefore actually experienced a stress response when told to relax. Interviews with the patients disclosed that they had expected a trick or surprise stimulation since they had been told on the day preceding the first experimental session that a noxious stimulus would be applied following a resting period, and this was actually done in three of the four trials. The means of each of eight autonomic variables immediately before and after the relaxation instructions were compared. All eight variables showed small changes consistent with the presence of a stress reaction.

V. *Summary and Discussion*

The findings of this investigation indicate that stress causes changes in spasticity in paraplegic patients consistent with the theory that adrenergic substances inhibit reflex activity and cholinergic substances enhance it. Following a stressful experience, a short period of decreased spasticity is followed by a longer period of spasticity greater than the resting level. It has been frequently observed by patients and physical rehabilitation workers that patients, during the stress of the intense efforts required for such strenuous activities as brace walking, frequently experience a decrease in spasticity, but that they "pay for it later" by increased spasticity. The present findings shed a new light on the generally accepted theory that muscular fatigue accounts for a decrease of spasticity in some patients. If it is true, as this investigation suggests, that increased adrenergic substances causes a decrease in spasticity, it would logically follow that, barring other medical or psychological contraindications, medication, psychological stimulation, and increased activity which enhances sympathetic functioning may ameliorate spasticity. Such treatment should provide a constant increase in sympathetic activity rather than sporadic bursts which, per se might be followed by "over-reactive phases" of increased spasticity.

NEW DOMICILIARY PROGRAM FOR VA

Veterans Administration in September launched a program of planned living to rehabilitate the aging and aged veterans in its domiciliary "homes."

VA said the program is another phase of its many-sided scientific attack on the growing problem of providing the type of medical and domiciliary care for aging and aged veterans that will best enable them to lead useful lives with the maximum freedom from hospitalization.

The new domiciliary program is designed to rehabilitate as many domiciliary members as possible to enable them to become productive citizens again in their home communities.

For those who are not susceptible to this advanced type of rehabilitation, the program is designed to enable them to enjoy the remaining years of their active lives more fully with security and dignity, VA said.

This program will be applicable to the 17,000 members presently receiving sheltered care in the 17 VA Domiciliaries. Future members will benefit by the experience gained in this progressive move, VA said.

Domiciliary members are disabled veterans who are so incapacitated that they are unable to earn a living, but do not require full-time nursing or hospital care. Most domiciliary members are in the older age brackets.

The new program has three objectives:

1. To provide a place where eligible disabled veterans can live under conditions which will promote their health and contentment.

2. To furnish authorized articles and services which they are unable to provide for themselves, including necessary medical care and hospitalization.

3. To institute rehabilitation measures so as to enable each disabled veteran to return to his community or, where this is not possible, to function at maximum capacity in domiciliary status.

The heart of the program is an activity planning board which will draft an individual plan for each member. The plan will provide for constructive effort by the member toward his own maintenance and participation in social and organized recreation activities. This daily plan of living will be based upon a full medical evaluation and will be supplementary to prescribed medical care by contributing to medical and social rehabilitation objectives.

The medical evaluation will have a two-fold purpose: (1) to determine the need of a health maintenance program for each member so as to prevent or retard physical or mental deterioration which would require more intensive medical care or hospitalization later on, and (2) to establish the physical and mental capacity of each member for constructive assignments.

The constructive assignments, VA said, are to add dignity, meaning and direction to the members' daily living —a goal toward which they may strive, either for self-care and maintenance or for a specific job inside or outside of the domiciliary.

For certain selected members, VA paid employment will be provided primarily as a part of a rehabilitation program for building self-reliance.

VA said members will be encouraged to apply for member jobs in which they have had previous experience or for which they may become qualified through training. These jobs may be in the domiciliaries themselves, or in VA hospitals or centers.

While they are working in these jobs they will be known as member-employees. They will continue to live in the domiciliaries as members, but will receive modest salaries or wages.

When they are sufficiently rehabilitated to leave the domiciliaries as members, they may be employed by VA as regular civil service employees if they qualify or they may seek employment elsewhere with the assistance of the U. S. and State employment services.

As part of the new program, VA is discontinuing all military terminology in connection with domiciliary activities because it no longer applies. Under this change, barracks will become buildings, companies will become sections, company commanders will become section leaders, and sick call will become domiciliary clinic.

The new program also calls for periodic medical examinations of members as part of their continuing evaluation for rehabilitation, health maintenance, and planned activities.

EXERCISE THERAPY FOR PATIENTS RECOVERING FROM CARDIAC DISTURBANCES*

ALFRED EBEL, M. D.**

Prior to June 15, 1944 the symposium in which we are participating today would have been entirely impossible. It was on that momentous day in Chicago, on the occasion of the 94th Annual Session of the American Medical Association, when, before the section on Experimental Medicine and Therapeutics, a symposium was held on the *Abuse of Rest in the Treatment of Disease*. For years previous to that date the use of bed rest in the treatment of disease processes had played a major role in the practice of medicine and surgery. This was undoubtedly the result of the unquestioned authority of two men, Hilton and Virchow. The concept that rest is a universal panacea stems from Hilton's classic *Rest and Pain*, written in the middle of the nineteenth century and during the early years of the nineteenth century bed rest was rarely used in the treatment of disease. Such astute observers as Withering, who in 1785 gave an account of the therapeutic effects of the Foxglove, the precursor of digitalis, and Heberden, in his *Commentaries on the History and Cure of Disease* published in 1802, scarcely ever mentioned rest as a therapeutic modality.

Excellent medical histories of two well-known physicians of earlier days are cases in point. John Hunter began to have severe anginal attacks at rest in 1785 at the age of 57. For the next eight years he had numerous prolonged periods of pain which were undoubtedly caused by myocardial infarction and myocardial insufficiency. At the time of his death in 1793 post-mortem examination disclosed extensive disease of the coronary arteries, calcification of the aortic valves, and two large scars representing old myocardial infarcts. During this eight year period John Hunter continued a very active medical practice, apparently did much of his best work, and never remained in bed for any prolonged period of time.

The history of Sir James Mackenzie is even more striking. He began to have minimal attacks of angina pectoris in 1907 and 1908. He lived for seventeen years after onset of these symptoms and during this period had many seizures of mild pain and several severe and prolonged attacks. At post-mortem extensive myocardial disease was found. He, too, led a most active life following onset of his illness and is said to have continued with his golf for the first fifteen years of his disease until he was finally forced to desist by progressive decline in exercise tolerance. He rarely spent more than a few days in bed at any one time. There are some who might feel justified in assuming that he would have lived longer had he been forced to remain in bed for several months after each of his major heart attacks. But there is little doubt that he could not have enjoyed life to the same degree had he permitted himself to become an invalid for fear of the consequences of his continued physical activity.

Following publication of this new concept of the deleterious effects of bed rest in the treatment of disease, much experimental work has been carried out in numerous clinics and medical centers. In short order there appeared articles calling attention to the evils of prolonged bed rest in surgery, orthopedics, obstetrics and gynecology, in cardiology and even in psychiatry. Many complications which formerly were considered unavoidable in the treatment of medical and surgical disorders were recognized as being the result of prolonged immobilization. One need only recall the drastic changes in surgical practice which followed in the wake of this new trend. Patients who, following appendectomy, were kept flat on thir backs for ten days are now up and about twenty-four hours after leaving the operating room. Hernioplasty called for twenty-one days of strict confinement to bed. Today this period does not exceed four or five days. How great have been the strides is best exemplified by an experience which I personally had only several days ago. One of my colleages, new in our department of Physical Medicine and Rehabilitation, was in the process of examining a patient who had been referred to the clinic because of some peripheral nerve problem which had developed in one leg. With amazement he came running to inform me that this patient had had a partial gastrectomy only four days ago and here he was down in the clinic, sutures still in place, ambulatory without assistance. What a far cry from the dark ages of eleven or twelve years ago!

I have been told that the general theme of this convention is Education. This is unquestionably a

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* Presented at the Ninth Clinical and Scientific Conference, The Association for Physical and Mental Rehabilitation, June, 1955.

** Ass't. Chief, Physical Medicine and Rehabilitation Service, Veterans Administration Hospital, Bronx, N. Y.

most important theme, because it is in this area of education where much still remains to be done. This is particularly true in the fields of internal medicine and cardiology, where the principles of early physical activity following disease are still frequently neglected. Indeed there are many otherwise well-qualified physicians who today do not clearly know the function and scope of Physical Medicine and Rehabilitation. Our emphasis should be in that direction.

Many physicians, although well aware of the fact that exercise is in itself not detrimental to the well-compensated cardiac patient are nevertheless reluctant to advocate physical activity for these patients because of fear that any complication which might remotely be attributable to the physical activity prescribed by them would reflect poorly upon their clinical judgment. It has been well established by Benton and his associates that there is no significant difference in the oxygen consumption required for each of several activities between the normal individual and the compensated cardiac patient. Schneider and Karpovich were able to establish that very few work situations, except heavy labor, require an output of more than two of four times the resting energy metabloism. The period of bed rest need therefore not be prolonged beyond the time required for heart muscle to heal or for cardiac compensation to be established. Bed rest should be avoided altogether in patients whose shortness of breath is the result of neurocirculatory asthenia or anxiety neurosis. Controlled physical activity is desirable as soon as absolute rest, based on medical necessity, is no longer required.

The purpose in prescribing exercise for the patient convalescing from heart disorders is fourfold. The greatest danger arising from bed rest in patients with heart failure or following myocardial infarction lies in the possibliity of phlebothrombosis and consequent pulmonary embolization. These complications accounted for a large proportion of the sudden deaths which were so common on medical and cardiac wards in the days preceding the era of physical activity. By promoting deep breathing several times a day venous return is improved. The patient is encouraged to turn from side to side, with assistance if necessary, to prevent stagnation and pooling of blood in the dependent parts of the body. Exercise therapy, consistent with the patient's general physical status with the stage of convalescence, is carried out several times a day. This may consist of simple passive range of motion of the legs and thighs and of the upper extremities in the patient who is still quite ill, or to active or even mildly resistive exercise of all joints of the extremities in the patient who is well along in his recovery.

The danger of bronchopneumonia, always a serious threat in a patient with bronchial or pulmonary stasis secondary to congestive heart failure, is markedly enhanced by inactivity in bed. This is particularly true in obese or elderly patients. This once serious roblem has been largely conquered through the use of the antimicrobial drugs, but considerable morbidity and prolonged hospital stay could be avoided by the judicious use of physical activity designed to promote pulmonary blood flow. This is best achieved through the exercises already mentioned in conjunction with phlebothrombosis, plus frequent expectoration of secretions and postural drainage.

Pain, stiffness and limitation of motion of the shoulder and hand are at times associated with heart disease, usually following myocardial infarction. The symptoms may be mild, or they may be so severe as to result in a "frozen shoulder". The left side is involved more frequently than the right, and the cause is said to be a dystrophic disturbance of the muscles and ligaments through reflex stimulation via the cardiac pain fibres. Others believe that protective disuse is the major factor. Although the disability may resolve spontaneously after six months to a year, early activation of the joints most frequently involved will do much to prevent, or certainly minimize the problem. The patient who is still on complete bed rest should be positioned properly in bed to avoid constant "drag" on his shoulders. As soon as physical activity is permitted graded exercises to both shoulder girdles through full range of motion and in all planes is begun. This procedure is carried out several times a day until the patient reaches modified bed rest status. Additional measures to relieve pain may be used if needed. By preventing the continued pull of gravity on the ligamentous structures of the shoulders, and by preventing shortening of the periarticular ligaments and tendons the problem of shoulder pain can be often avoided.

One of the most serious problems encountered by the patient with heart disease is the fear of chronic invalidism, the conviction that productive life is at an end for him, and that the remainder of his life must be lived out in relative inactivity, in total unproductiveness, and under the constant threat of sudden death. It is not difficult to see why this concept has become so prevalent. Our press and other means of communication have impressed upon the public's mind the seriousness of heart disease, the high incidence of the problem, and the disastrous results which come in its wake. Unfortunately the medical profession, by its conservative attitude, has done little to dispel these ideas and has actually encouraged inactivity and unproductiveness when it really meant to foster the principle of relaxed living. The advice so

frequently given "to take it easy, to stop working, to rest, to stop smoking, to stop eating, to stop drinking;" in short, to stop living, has so impressed the public that today a large proportion of cardiac patients are, in addition, psychiatric patients. This psychological problem is of even greater significance when we realize that in an extensive and careful study of cardiac patients by the Work Classification Unit at New York University, fully twenty-five precent of patients diagnosed as having heart disease did not in fact have any organic cardiac disorder. It is therefore incumbent upon us in the field of Physical Medicine and Rehabilitation to impress upon our colleagues in general medicine and cardiology the tremendous value of properly graded physical activity in preventing these neurotic tendencies in patients with heart disease or in overcoming them once they have developed.

To accomplish this goal physical activity of the mildest sort is started just as soon as the patient is out of immediate danger. Passive range of motion of the major joints may be adequate to prove to the patient, and his family, that his situation is not hopeless. As soon as the early fears have been overcome he may be started on some simple hand activities which may perhaps he best accomplished through occupational therapy. With further improvement the patient is encouraged to turn from side to side, to carry through a few repetitions of active range of motion, first of the smaller and more distal joints, later of the larger ones, until the next stage is reached in which many of the less strenuous activities of daily living are carried out, with or without assistance as required. During this modified period of bed rest the patient is permitted to dangle his feet from the side of the bed, to sit up in bed for short periods of time several times a day, to go to the bathroom in a wheel chair, and perhaps to sit up for his meals. When maximum benefit has been obtained from bed rest and from other medical measures the patient is gradually permitted and encouraged to resume physical activities until ambulation with assistance can be resumed. This program is continued with constant increase of the activities, under close observation for symptoms of dyspnea, fatigue, cyanosis, or edema. The patient's cardiac reserve is tested by progressively increasing his physical activity, both on the ward and in the clinics, until he has been restored to full activity wihin his cardiac reserve.

The value of physical exercise for improving the fitness of heart muscle which has failed has been the subject of considerable study. No definitive answer is as yet available. There is evidence which indicates that training improves cardiovascular dynamics. It has been shown that blood pressure and pulse rate increases are less marked in the trained individual, that stroke volume is larger, and that oxygen consumption is less. These factors indicate that training produces an increased efficiency of the peripheral muscle machine and adjustments of the cardiovascular system. However, scant information is available concerning the effect of training in the cardiac, and further study is required in this important aspect of cardiac rehabilitation. Training within the limits of cardiac reserve should be used to develop greater efficiency in muscle performance. Whether cardiac reserve would also be increased is entirely speculative. At present the prescription of exercise in the cardiac remains a matter of clinical judgment until more information and simpler methods for studying blood flow in man are available. Nonetheless, exercise in the patient with heart disease is necessary to avoid metabolic deterioration, to prevent thromboembolic phenomena and pulmonary complications, to eliminate tissue changes in and around the joints with the associated limitation of joint motion, and last but not least, to retain the emotional stability of the patient and his environment.

"From Other Journals"

WILLIAM H. BLAD, *et al*, "Studies in Muscular Dystrophy and Myotonia Dystrophica with Sodium[22] and Potassium[42], *Neurology*, 5:201-207, March, 1955.

Radioactive potassium[42] was given orally immediately following the intravenous administration of sodium[22]. In the majority of patients with muscular dystrophy, physical disability was proportional to the level of exchangeable potassium. Sodium values for the most part fell within the normal range. There may be a gradual lowering of body potassium during early stages of certain muscle diseases, due to an inherent intracellular defect resulting in the gradual leakage of cellular potassium and its subsequent renal loss from the body. This is followed by a compensatory intracellular accumulation of sodium and water. The failure of the usual homostatic mechanisms to readjust the internal environment of the cell may then lead to its ultimate destruction. There may be a critical level of body potassium below which normal muscle function is no longer maintained, resulting ultimately in muscular atrophy and degeneration.

PJR

EDGAR M. BICK, "The Physiology of the Aging Process in the Musculoskeletal Apparatus," *Geriatrics*, 10:274-277, June, 1955.

In normal aging, musculoskeletal apparatus articular cartilage is the most stable and least contributory to disability and dysfunction. Normal ostegogenesis takes place by the formation of bone trabeculae and its calcification. There is a continuous deposit of new molecules and absorption of the old. In the normal aging skeleton there is an imbalance in the deposition-resorption equation. Absorption continues to take place normally but deposition of bone protein diminishes. In the muscular apparatus diminished strength results from failure of the neural control mechanism, lessened rapidity of chemical reactions involved in muscle contraction and decreased ability of the vascular tree to deliver elements needed to replace those used up. This leads to atrophy of disuse.

PJR

"The Future of Boxing," *The New England Journal of Medicine*, 252:918, May 26, 1955.

Boxing is a popular and spectacular sport. It has a natural appeal to young men and not only develops a healthy and rugged physique but leads to self-discipline. At the amateur level it can play a part in the control of juvenile delinquency. At the professional level it requires the instincts of a gladiator. The recent waves of death from boxing raise the question of whether professional boxing is a reasonable sport. Much has been done to make boxing safer. It seems likely that since in professional boxing the objective will always be to render one's opponent unconscious, sufficiently effective measures to prevent injury would make the avowed objective of the sport unattainable. Perhaps this will be the end of professional boxing and the real future of amateur boxing.

PJR

A. W. PENNINGTON, "Pyruvic Acid Metabolism in Obesity," *The American Journal of Digestive Diseases*, 22:33-37, February, 1955.

Rubner's "isodynamic law" holds that, calorie for calorie, carbohydrate and fat are interchangeable in respect to their effects on the energy balance, but it has been reported that subjects lose much more weight on a high fat diet than on a high CHO diet of equal caloric value. There seems to be reasonable evidence that fat and CHO are not always identical in their effects on the energy balance. Controlled experiments do not support the view that high protein diets are especially valuable in weight reduction, but they may help in the long run by their effect in gradually increasing the basal metabolism. One cause of obesity seems to be that impaired activity of the enzyme lipoic acid conjugase permits pyruvic acid to accumulate in the tissues and more than a usual amount of it is diverted to fat formation. Restriction of CHO reduces the amount of pyruvic acid formed. Only 10% of fats is metabolized by way of pyruvic acid. Provided CHO is restricted sufficiently, there does not seem to be any reason to restrict fats.

PJR

W. H. LANE, "A New Boon to the Aged—Relief of Nocturnal Leg Cramps," *American Practitioner*, 6:578, April, 1955.

Nocturnal leg cramps occur with increasing frequency in patients over 50 years of age. They occur after an hour or more of sleep and are relieved by getting up and walking around and rubbing the thigh and calf muscles. The cause is apparently sclerosis and partial occlusion of some of the arterioles. In sleep the physiologic fall of blood pressure deprives some areas of adequate circulation. A dosage of 100 mg. of orthoxine hydrochloride at bedtime will prevent these cramps.

PJR

JANET TRAVELL, "Referred Pain from Skeletal Muscle," *New York State Journal of Medicine*, 55:331-340, February 1, 1955.

Observations on skeletal muscle pain have been made in large numbers of patients with somatic and visceral pain syndromes. A common denominator was the presence of trigger areas in the skeletal muscle. This is a localized spot of deep tenderness, with a lowered deep pain threshold. When the portion of the muscle containing a trigger area is rolled under the finger, a localized twitch is usually observed. Fasciculation is often set off and may persist for several seconds. When pressure is sustained on the tender spot, pain is usually induced in a remote area. Most skeletal muscle pain which constitutes a clinical problem is referred. A trigger area at a particular site gives rise to essentially the same distribution of referred pain in all individuals. This implies anatomic pathways linking trigger areas with the CNS. Referred pain may be continuous or discontinuous. It can usually be localized by the patient. It may be accompanied by deep tenderness, increased muscle tension, fasciculation, lowered skin resistance, lowered skin temperature, sweating and other signs. Application of ethyl chloride spray and local infiltration with procaine, physiologic saline or dry needling may block referred pain. Trigger areas are clinically activated by sudden trauma to the musculoskeletal structure, unusual or excessive exercise, chilling, immobilization, an acute visceral lesion, acute arterial closure in the extremities, rupture of an intervertebral disc with nerve root pressure and acute emotional stress. Conditions which predispose trigger mechanisms include muscular strain, general fatigue, acute infectious illness, a chronic focus of infection, nutritional deficiencies, a progressive lesion of the nervous system, nervous tension, menopause and male climacteric, and hypometabolism with creatinuria. One trigger area may be secondary to another.

PJR

William P. Shepard, "Does the Modern Pace Really Kill?" *Journal of the American Geriatrics Society*, III:139-145, March, 1955.

The death rate at ages 45 and over has declined steadily among the white males over the last 22 years, but the death rate from diseases of the coronary arteries and agina pectoris has increased nearly fivefold since 1930. It would seem something is happening either in the environment or in the human organism which damages the coronary arteries much more frequently than twenty years ago. Deaths from other disorders of the heart have decreased markedly. Cancer of the respiratory system among white males has increased four or fivefold. There is little evidence of physical harm in work per se. Probably what really counts is the individual's reaction to his work. There is great variation in abilities to stand stress. Executives and other leaders should be selected from among those who possess such abilities in a high degree.

PJR

IB PERSSON, "Reflections on the Pathogenesis of Progressive Muscular Distrophy," *Neurology*, 5:333-335, May, 1955.

Progressive muscular dystrophy is a disease on whose pathogenesis there has been no agreement. Part of the iron in muscles occurs in as yet incompletely understood combination with actomyosin, and this combination can initiate a contraction on addition of adenosine triphosphate. It is suggested that the pathogenesis of progressive muscular dystrophy is an inherited or acquired disturbance in the combination between the iron-actomyosin and ATP, which causes contraction of the muscle.

PJR

Editorials

THE RETIREMENT OF DR. DAVIS

Announcement of the retirement of Dr. John E. Davis, Chief, Corrective Therapy in the Veterans Administration, came as a distinct surprise to many therapists in the field who had grown accustomed to the guidance and leadership which he had provided for the profession during all of its years of growth and development. However, Dr. Davis' assurance that he will continue his active interest in the affairs of this association and in the profession as a whole is welcome news to all those who had initially experienced consternation and dismay at the unexpected news.

As founder of this association, and in many ways its guiding light, Dr. Davis has maintained a paternalistic interest in the growth of the organization, encouraging its progress and lending great support to all its many activities. In professional matters, his sincerity, zeal and crusading spirit in behalf of a philosophy of rehabilitation based upon humanistic values has had a considerable effect on prevailing concepts regarding the mentally and physically disabled. He has been particularly successful through his many books, professional articles and lectures on the psychiatric patient in propounding a specific and unique therapeutic role for the use of exercises, activities, games, play situations and other tools common to the field of physical education. He believed, furthermore, that specifically trained and psychiatrically oriented physical educators were ideally fitted to carry on this specialized program. Thus, the growth of corrective therapy in NP hospitals, stimulated by the development of special schools under the direction of Dr. Karl Menninger, was an outgrowth, a fulfillment, and an acceptance of much of this philosophy.

In announcing his retirement, Dr. Davis emphasized the fact that he believes that the foundations upon which corrective therapy has been based are now firmly established and that he felt free to devote the remainder of his life almost exclusively to writing, lecturing, and teaching.

As leader, counselor and friend, Dr. Davis has provided hundreds of therapists with encouragement, wisdom and the benefit of his warm and generous personality. We wish him the best of health and happiness in his future endeavors secure in the belief that he will never cease to take an active role in the affairs of our organization.

RESEARCH-MINDEDNESS

The primary objective of the current issue of the *Journal* is to draw our reader's attention to the subject of research, to present several articles dealing with this important topic and to attempt to stimulate the therapist in the field to further efforts in this direction.

Aside from purely creative pursuits, there are few fields of endeavor which today are not intimately linked with scientific research and the constant quest for discovering the true facts.

The development of the scientific method constituted a revolution which permeated our entire culture and left a trail of customs, traditions, and ancient prejudices in its wake. Experimentation, the accumulation of data, and objective analysis are methods as familiar today to the scientific farmer as to the psychologist and our researchers operating in a wide field of investigation have provided us with a material existence unparallelled in the history of mankind.

The background of every profession demonstrates an early growth and development followed by a long plateau in which progress levelled off as a result of the general acceptance of prevailing ideas, the consolidation of customs and traditional methodology. We would undoubtedly still be at this plateau if the scientific method had proved unsuccessful in demonstrating how to discover facts, how to analyze and apply them to existing problems. It is inconceivable how future progress can be made in any profession without recourse to additional research.

As an organization, our association has constantly urged its members to contribute to scientific research projects in the field of exercise and its relationship to the physically and mentally handicapped. This is a specialized field and it is most unlikely that other researchers not intimately concerned with this specialty will carry on extensive investigation in this area. Therefore, for the most part, the brunt of the collection of data, investigation and analysis must fall upon the therapist himself. Another responsibility lies in the area of application of research for it is obvious that research can be of only academic interest unless its utilitarian value to the therapist can be demonstrated and it can be put into general practice. The dissemination of such material is one of the principal functions of this *Journal* and we trust that our readers will continue to pursue the literature thoroughly so that we can veritably build our future on the solid rock of objective facts.

Book Reviews

"Kinesiology of the Human Body," by Arthur Steindler. (Springfield, Illinois: Charles C. Thomas, 1955. 708 pp. $19.50).

Here is the definitive text in the field of advanced kinesiology. While it is subtitled "Under Normal and Pathological Conditions," the book is primarily concerned with pathomechanics. It is not designed to replace texts such as those of Wells or Morehouse and Cooper in the hands of students of physical education or undergraduates. Unfortunately, its price will probably debar most Corrective Therapists from the purchase of a personal copy. Nevertheless no college or hospital library should be without a copy, and no Corrective Therapy department should rest until it has one available for department use. This reviewer will not even attempt a critical review of its contents; probably only a handful of men in the country are capable of making such an analysis. Suffice it to say that the book covers in great detail the physical properties of the components of the human body, the mechanics of joint and muscle action, balance, movement and pathomechanics. Clinical application is stressed and there is an absolute minimum of mathematics. It is profusely illustrated and is indexed both by author and by subject. Each chapter is followed by a bibliography. For years Dr. Steindler has been the outstanding authority in his field. This text represents the fruit of his life study. It is a master work—one which is not likely to be superceded during the working life of therapists now active.

PJR

"Clinical Psychiatry," by Mayer Cross, Eliot Slater and Martin Both. (Baltimore: The Williams and Wilkins Company, 1955. 652 pp. $10.00).

This text is a systematic presentation of the more important general concepts relating to psychiatric knowledge. Based upon a multidimensional approach, the authors make a valiant effort to comprehend observable facts rather than abstract issues. Material is well organized with sub-headings clearly noted and integrated into the diagnostic categories. Sections on mental deficiency, child psychiatry, geriatrics and legal and administrative psyhciatry are clear and concise in presentation.

This book should be well received by the medical student, social worker, and psychologist as either text or reference. Reference and index sections are unusually complete. To the psychiatrist it offers a ready source for teaching and/or reference on diagnosis and treatment of mental illness.

DCL

"Physical Education for Children," by D. Cyril Joynson. (New York: Philosophical Library, 1954. 215 pp. $4.75).

This book is written by a British physical educator, designed specifically for physical education teachers of children between the ages of five and eleven years. The book includes ". . . the structure of the daily lesson; teaching technique; prepared sets of exercises involving the use of small apparatus; classification of agilities; dextrous exercises and skills; dancing, creative and expressive movement; modern apparatus; and equipment." The terminology and games are of the British style and differ in many respects from the activities ordinarily used in the American schools. Although the book is elementary and easily understood, it is not worth the price for use as a personal reference book considering the many outstanding American physical education texts that deal specifically with our problems and needs.

HJB

"Breaking Patterns of Defeat" by Richard L. Jenkins, M.D. (New York: J. B. Lippincott Co., 1954. 270 pp. $6.75).

The author makes it very clear in the Forward to his book that the work is intended for students of human personality who are early in their training as professional workers. He mentions in particular psychiatrists, psychologists and social workers. The reviewer recommends that the reader keep in mind the complete contents of the author's Forward as he reads the book because of the nature of its contents. An immense amount of material concerning disturbed human behavior is covered in 22 short chapters. The author follows the human being from infancy through the later years of life, and in the last five chapters attempts to cover such material as "The Signifance of Cultural Differences for Personality Organization", "Elements of Psychotherapy", and "Dynamic Psychiatry and its Relationship to Other Conceptual Systems".

Dr. Jenkins has provided within this very broad framework much challenging material which should serve to stimulate the students' interest and curiosity because while it attempts to answer many questions, it raises a host of others for discussion. For this reason the reviewer feels that the book will best serve as a basis for discussion and point of departure and that for beginning students interpretation, clarification and elaboration by an instructor is required in order that the student will avoid the trap of oversimplification.

The volume is not for the sophisticate in psychiatry or psychology. The author suggests that in writing it he has attempted somewhat of a synthesis of different dynamic points of view, but what really comes out of this attempted integration is the author's own point of view. To the sophisticate in the field of human behavior many of the author's explanations seem oversimplified and rigid in formulation. In other words, in an attempt to present a great deal of material the author has found it necessary to seem unduly pat in his explanations and interpretations.

By far the greatest part of the book is taken up with describing the author's opinion about the factors causing various patterns of defeat to come to being, and there is relatively little material having to do with treatment, particularly as to details of the techinque and the dynamics of the patients' movement through the treatment process. In nearly every chapter in which the author's clinical concepts are dealt with, for example, Emotional Exploitation, Patterns of Withdrawal, Patterns of Excessive Rivalry, case material is included which is interesting but to a varying extent lacks completeness in dynamic formulation so that the reader sometimes feels that the author felt a need to wrap up the patient and his problem in too neat a package.

There are many diagrams throughout the book intended to illustrate the author's concepts of the formulation of patterns of defeat. This reviewer did not find them helpful but thinks that others used to reading mechanical diagrams might very well find the diagrams quite useful.

In summary, the reviewer feels that this book is useful for the purposes explicitly stated in its Forward, provided that the student reads it with supervision, discussion and interpretation.

Frank F. Tallman, M.D.
Professor of Psychiatry
University of California, Los Angeles

BOOKS RECEIVED

Essays on Gravity. New Boston: Gravity Research Foundation. 34 pp. plus Supplement. No date. Free.

CORRECTION

The volume, "Existence and Therapy" by Ulrich Sonnemann was listed erroneously in this column in the July-August issue. The correction follows:

"Existence and Therapy" by Ulrich Sonnemann. (New York: Grune and Stratton, Inc., 266 pp. $7.75).

Chapter Activities

All chapters are urged to appoint a representative to report chapter news on a regular basis to the Chapter Chairman, Mr. Sam Boruchov, 147-02 77th Rd., Kew Garden Hills, N.Y.

TEXAS - LOUISIANA CHAPTER

George "Jog" Allen has resigned as President of the chapter due to his recent transfer to the Ft. Lyons (Colo.) V.A. Hospital where he has been appointed Executive Assistant, PMRS. The following will hold office for the remainder of the current year: President, Dr. Ernest A. Wilbur, New Orleans; Vice-President, Jewett L. Hunter, McKinney, Texas; Secretary-Treasurer, Victor A. Cerise, New Orleans; Past President, John J. Arena, Houston, Texas.

The following chapter members have been presented incentive awards by the Veterans Administration for suggstions relating to improved patient care and treatment: Edward Maas, Temple, Texas for designing a cuff and cuff belt for exercising amputees; J. R. Green, Houston, Texas for improvement of the knee board brace used by patients while standing in parallel bars and Ernest Raines, also of Houston for improvement of the overhead sling suspension frames.

ANNUAL SOUTHEASTERN CONFERENCE

The annual clinical and scientific conference of the Southeastern Chapter will be held Oct. 20-22 at the V.A. Hospital in Lake City, Fla. A business meeting and dinner will be held on Oct. 20 and clinical sessions will begin Oct. 21. The entire chapter has been invited to visit the winter home of Dr. and Mrs. John E. Davis at Keystone Heights on the 22nd. All chapter members as well as visitors from the national organization are welcome.

CALIFORNIA CHAPTER
PROFESSIONAL PAPER AWARD

This last year three papers were submitted for the Professional Papers Award presented through the California Chapter of our Association. A special committee selected the paper "Corrective Therapy and Procedures in the Treatment of Arthritis" by Mr. Leo Berner as the winning paper. The committee members serving this year were Dr. Carl Young, Dr. Laurence Morehouse, Dr. Harvey Williams and Dr. Morse Manson, Chief, Vocational Conseling Service, of the new VA Hospital at Sepulveda, California. He was formerly Chief of this service at Long Beach, California. Dr. Young, Dr. Morehouse and Dr. Williams are members of the local chapter Advisory Board. George Devins, Chief, Corrective Therapy, Long Beach, serves as committee chairman.

All papers presented by Corrective Therapists at the Boston Convention should be sent to George Devins for judging in this year's competition.

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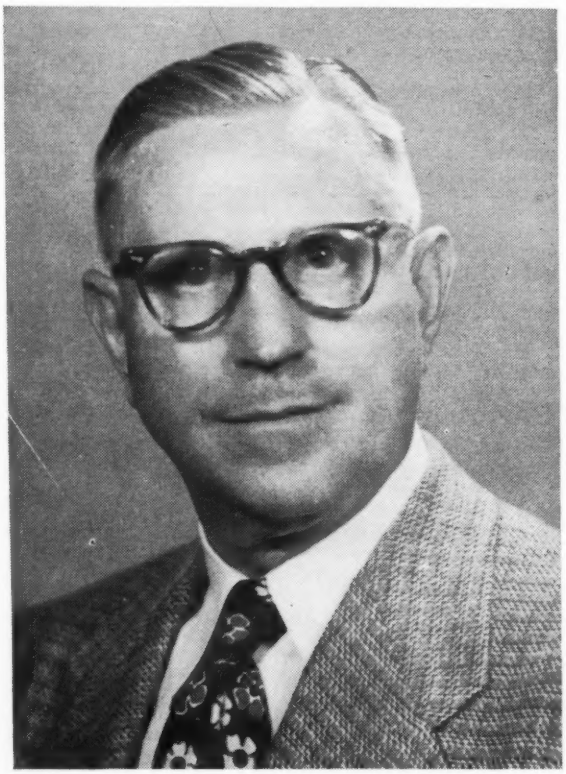
News and Comments

DR. JOHN E. DAVIS RETIRES

Dr. John Eisele Davis, first Chief of Corrective Therapy in the Veterans Administration and a pioneer in the development of activity programs for mental patients, retired from the agency on Sept. 30 after 35 years of Government service.

Scientist, author, teacher and athlete, Dr. Davis left VA Central Office in Washington, D.C. at the age of 60 for an active life of writing, teaching, and lecturing.



Dr. John E. Davis

Dr. Davis was the founder of the Association for Physical and Mental Rehabilitation in 1946 while he was conducting special training courses for corrective therapists with Dr. Karl Menninger at Topeka, Kans. He has maintained a very active interest in the affairs of the organization, serving as a frequent speaker at its annual conventions and as chairman of the 1953 meeting in Washington.

He is the author of five books and several manuals on the subject of medical rehabilitation, corrective therapy, and recreation and has specialized on psychotherapeutic-activity approaches to the mental patient. He also has written more than 100 articles on his specialty, both technical and popular.

A veteran of World War I, Dr. Davis was rescued from the Tuscania, a troop ship torpedoed off the coast of Ireland in February 1918. He engaged in rehabilitation of seriously disabled soldiers in England and France during 1918-19.

Dr. Davis was born August 16, 1895 at New Britain, Pa., the son of a Baptist minister. He attended Richmond

University in Richmond, Va., and Washington College in Chestertown, Md. At Washington College, he was president of the graduating class, captain of the varsity baseball team and a member of the varsity football team. He received his M.A. in education from Washington College.

In recognition of his pioneering contributions to the field of physical and mental rehabilitation, he was awarded the degree of Doctor of Science, *causa honoris*, by his alma mater, Washington College.

He has taught and assisted in the organization of special courses in rehabilitation at Columbia University, New York University, and Springfield College. His most recent book, "Clinical Applications of Recreational Theapy", 1952 was published in this country and in England and has received world-wide recognition.

Dr. Davis has been with VA since 1922. He is a fellow of the Association for Health, Physical Education and Recreation; a member of the American Psychological Association, and a member of the medical advisory board of the Association for Physical and Mental Rehabilitation.

Dr. and Mrs. Davis have one son, Dr. John E. Davis, Jr., who is a clinical psychologist in the VA hospital at Lexington, Ky.

Dr. Davis, Sr. will divide his time between his summer home at Rehoboth Beach, Del., and his winter home at Keystone Heights, Fla.

AWARDS COMMITTEE

The Boston Convention was the setting for the presentation of awards for accomplishment during the year 1954.

The John E. Davis Award was presented to Dr. Karl Menninger for his outstanding contribution in the field of Rehabilitation. Previous winners of this award are as follows: Dr. Davis, Dr. A. B. C. Knudson and Dr. Edward D. Greenwood.

Mr. Russell Williams, Director of Blind Center at VA Hospital, Hines, Illinois, won the Achievement Award in Rehabilitation for contributing most to his own rehabilitation, thus giving leadership and incentive to others with disability. Mr. Williams is the first person to win this award given by the Association.

Another award presented for the first time was the "Annual C.T. Award." This is presented to the person whom the membership feels has been outstanding in the field of Corrective Therapy. Many candidates were suggested for this award indicating the fact that there are very competent and capable people yet to be singled out for this award. It was presented to a person who had been recognized as a leader by virtue of his election to the presidency but whom the membership wished to acknowledge further as a very capable and all around therapist in the clinical setting. This person was none other than our past President Louis Mantovano. It was appropriate that the membership should acknowledge this "energetic" man's ability over and beyond the official position he held. Congratulations, Lou!

The committee requested an earlier deadline for submitting names of candidates for all awards. The new date is January 1 of each year insted of April 1. This will help by giving candidates selected, time to clear their schedules so they will be able to be present to receive their awards.

It is important that we receive candidates for the following awards as soon as possible: The John E. Davis Award, the Achievement Award in Rehabilitation, and the Annual C. T. Award. Candidates names for Honorary, Fellow and Life Membership should be forwarded as soon as possible.

Members who are presenting candidates will furnish statements of achievement in support of their recommendations. Those received this first year were very complete and made selection more valid.

Chapter and area representatives are urged to coordinate their efforts in order to present the most worthy candidates for all awards. Send all recommendations to:

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12591 Gilbert St.
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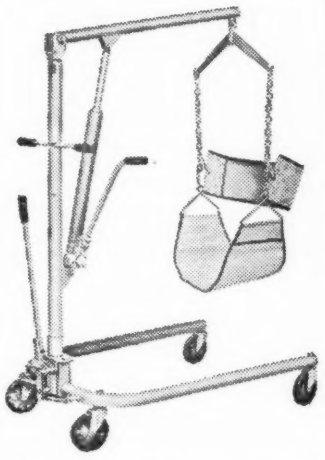

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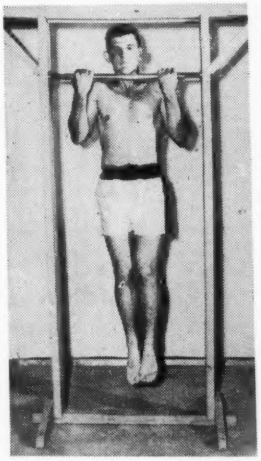

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AMENDMENT TO THE CONSTITUTION OF THE ASSOCIATION FOR PHYSICAL AND MENTAL REHABILITATION

The Board of Governors in a mail vote have approved the adoption of the amendment to Section 3 of the By-Laws of the Association for Physical and Mental Rehabilitation.

b. Annual membership dues shall be considered due on July 1 each year on a fiscal year basis.

c. In order to effect the change in date of membership dues on an equitable basis, there shall be published in the Journal and Newsletter for three (3) consecutive issues each, a chart and abstract explaining and showing the pro-rata basis for payment of said dues for the various expiration dates and the different types of membership.

The amendment goes into effect immediately and all the members will be expected to pay the amount shown on the table below by July 1, 1955. Those not complying within sixty days (by September 1, 1955) must pay the delinquency assessment of one dollar. Those who do not renew their active membership within six months of due date, January 1, 1955 and each year thereafter, will be dropped from the official roster and must apply as new members under the constitution to be readmitted.

TABLE SHOWING PRO-RATA PAYMENT OF DUES

DATE DUE	ACTIVE	PROFESSIONAL	ASSOCIATE
April 1955	12.50	6.25	5.00
May 1955	11.67	5.83	4.67
June 1955	10.83	5.42	4.33
July 1955	10.00	5.00	4.00
Aug. 1955	9.17	4.58	3.67
Sept. 1955	8.33	4.17	3.33
Oct. 1955	7.50	3.75	3.00
Nov. 1955	6.67	3.33	2.67
Dec. 1955	5.83	2.92	2.33
Jan. 1956	5.00	2.50	2.00
Feb. 1956	4.17	2.08	1.67
Mar. 1956	3.33	1.67	1.33
Apr. 1956	2.50	1.25	1.00
May 1956	1.67	.84	.67
June 1956	.83	.42	.33

It is of the utmost importance that all members cooperate in complying with the new amendment. We must keep our association on a sound financial basis and its operation on a high scale of efficiency. LET EVERYONE OF US BE ON TIME AND SEND OUR DUES TO THE MEMBERSHIP CHAIRMAN!

STANLEY H. WERTZ, *Secretary*

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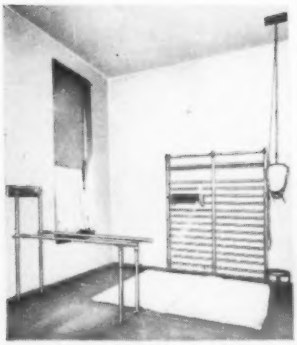

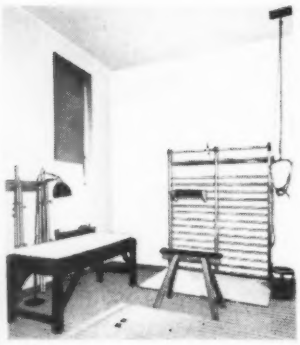

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